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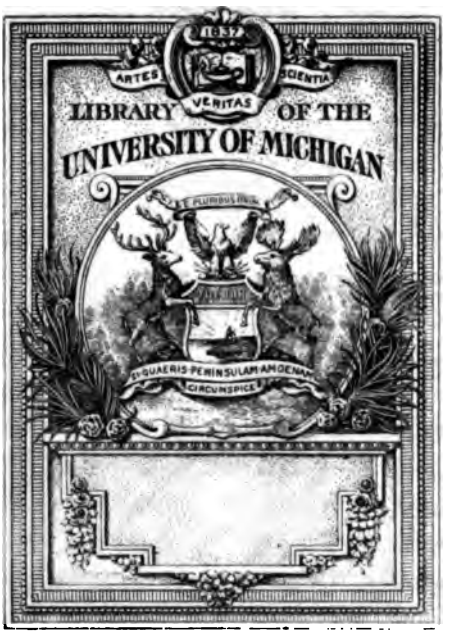
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THE HYGIENE OF NERVES AND MIND IN HEALTH AND DISEASE





Hygiene of Nerves and Mind in Health and Disease

By

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Authorised Translation from the Second German Edition

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G. P. Putnam's Sons
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Hygiene der nerven -

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TRANSLATOR'S PREFACE

EVERY science has its practical applications, and in our modern world these are the chief test of its value. But there is always danger of making the applications too soon, and developing bizarre astrologies and alchemies on the meagre foundations of some later astronomy and chemistry; and this danger is very great indeed when it comes to applying the little scientific knowledge that we have of the human mind, its laws of action, and its relations to the body. We have already had our era of phrenology, and in our own day there are legions of uninstructed people who hope to accomplish all sorts of ends by hypnotism, telepathy and mental healing, and the interplay of "subjective" and "objective" mind. It is true that of late years the scientific knowledge of mind has grown amazingly; yet the ascertained principles are still very scattered, and it is hard for any one, even the expert psychologist, to give their practical applications without carrying some of them to an extreme. The minute he goes beyond the veriest commonplaces his ground is likely to become insecure, and the more positive guidance he attempts to give on the strength of theoretical principles the more danger there is of his overlooking some concrete

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facts of which these particular principles take no account.

But even when the psychologist himself succeeds in laying down general principles and making new and useful practical applications of them without going to extremes, his reader may not take them so conservatively, especially if they be made in a popular book; for in such a book the principles and applications must be as simple and far-reaching as possible though the facts of mental life are tremendously complex, and it takes rare tact and insight to select a few very simple principles to represent the complex whole and apply them in such a way that they can be used practically without being greatly distorted or carried to harmful extremes by the very people who are in the greatest need of their guidance.

For such a task as this Professor Forel has very unusual qualifications. As a psychologist, especially in the fields of instinct and hypnotism, he has a world-wide reputation; his work as professor of morbid psychology at the University of Zurich has given him abundant opportunity for the investigation and explanation of mental disease from the standpoint of the professional student, and his position as director of the Burghölzli asylum has given him even more valuable experience as adviser to those who are, or feel themselves to be, in need of personal direction.

As to the translation itself, I have tried to follow the original with reasonable accuracy, though I have omitted or softened three or four unimportant

sentences which would be appropriate enough in a medical treatise but which were hardly suited to the larger American and English public whom I hope the book will reach.

Figures 9 and 10 of the original did not lend themselves easily to reproduction, and I have substituted two others procured through the kindness of Professor E. L. Thorndike.

H. A. A.



PREFACE

ACCORDING to the scientific theory of monism, or the "Identity" hypothesis—the only theory, in my opinion, which is consistent with the facts,—mind and living brain are one and the same thing. See Forel, *Brain and Mind*[1]; *The Mental Powers of Ants*[2]; *Monism and Psychology*.[3]

From this it follows that our mental life, and therefore our moral life too, is an expression of our brain life; and for this simple reason all the phenomena of mental life must be considered in any account of nervous or brain hygiene. Questions of social hygiene and of morals are more special.

My conception of popular hygiene is that it enables an intelligent layman with a fair education to govern his life in such a way as to avoid diseases and abnormalities as far as possible for himself, his fellowmen, and his offspring, and to promote the health and strength of them all in every respect.

Hygiene should in no wise supplant the expert

[1] *Gehirn und Seele*, E. Strauss, pub., Bonn.

[2] *Die Psychischen Fähigkeiten der Ameisen*, E. Reinhardt, pub. Munich. *Ants and Some Other Insects*, Kegan Paul, pub., London, 1904.

[3] "Monismus und Psychologie," *Polit.-anthrop. Revue*, 1903.

physician; and yet it should manage to make the occasions for his assistance as rare as possible.

I believe further that rules of hygiene whose grounds are not understood can easily do harm; and with the nervous system and its functions, which are commonly so badly misunderstood, a thorough explanation of the relations involved is on this account especially indispensable.

To my dear friend and colleague, Dr. Wolfgang Bach of Zurich, I must offer special thanks for the excellent assistance which he has given me in the revision of this work.

A. FOREL.

Chigny près Morges, Vaud, Switzerland, June, 1908.
[*Preface to second edition, dated Feb.* 1905.]

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THE HYGIENE OF NERVES AND MIND IN HEALTH AND DISEASE



THE HYGIENE OF NERVES AND MIND IN HEALTH AND DISEASE

INTRODUCTION

OUR power of forming proper judgments about what takes place in a person's mental and nervous life and its significance for the individual and for society at large is much impaired by lack of a proper knowledge of the brain and of psychology. The misunderstanding of mental processes, whether normal or abnormal, has a strong tendency to destroy harmony both in the narrower circle of the family and in wider social relations, and leads to the gravest errors in the estimation of a person's intellectual and moral value. This is injurious both to single individuals and to society as a whole. A judge, for example, who is without psychological understanding, is incapable of passing a just sentence, because he cannot form a proper estimate of the guilty man; and a physician who does not understand the brain and psychology in their relations to a person's life is like an electrician who putters with the wires without

knowing the construction and function of the central accumulators. In the same way, the teacher, the official, and others should understand psychology.

Thus nerve hygiene, especially on its social side, has a profound influence upon the mechanism of our human social life. Without a rational nerve hygiene there can be no healthy social development. It will be seen from this that we must begin a long way back. It is almost foolhardy to wish to master such a tremendous subject in such a limited space—and that too in a popular treatment. If I attempt it, nevertheless, it is because I am earnestly persuaded that it is in response to a real need. That is no empty phrase and I hope the reader will persuade himself of it. But I must beg for great forbearance, for patience, and for attentive reading in view of the very peculiar difficulty of my task.



PART I

MIND, BRAIN, AND NERVES IN THEIR NORMAL CONDITION



CHAPTER I

PSYCHOLOGY (THE SCIENCE OF MIND)—WHAT ARE SPIRIT AND MIND?

"NERVES," "brain," "spirit," "soul," "mind," are words which every one uses nowadays, without usually having a clear idea of their true meaning. To be sure the nature of mind and spirit and their relations to the brain is still one of the most persistently quarrelsome problems of philosophy. But without at least a partial understanding of the work of psychology, or the science of the mind, and the nature of brain and nerves, our subject cannot be grasped at all, and a mere play of words takes the place of understanding. So I beg the reader to courageously attack the following sketch of the normal life of mind and nerves and the normal structure of the brain and nervous system.

Let us then begin to make clear to ourselves what constitutes the content of our minds—the subject-matter of psychology.

Imagine that you are lying on a meadow near your house, looking at the blue sky and a flying bird. In this moment there apparently exist for you two things: the blue sky and the bird on the one hand, and

on the other your ego or " I " that sees the blue sky and the bird.[1] The sky and the bird you locate away off in the distance, outside of yourself; the " I " in yourself.

Now suddenly you have an uncomfortable feeling in your nose and immediately think of your bedroom, where you inadvertently left the pocket-handkerchief that you would like to use. The image of the bedroom and the handkerchief appears clearly before your eyes as what we call a *memory-image.* Not only the tickling sensation in your nose, but also the representation of the bedroom is experienced inwardly as a thought of your " I." Still there are bound up with these a set of other mental events: first, a feeling of annoyance at the disturbed rest; second, a growing impulse which leads to the resolution to go to the room and get the handkerchief; third, the idea of the movement, or the motor image of the act that you must perform.

In a simple incident like this we find in the closest connection, or as they say in psychology *associated* with each other, events belonging to the three principal spheres of mental life: knowing, feeling, and willing. Let us analyse all three.

1. *The Sphere of Knowledge.* The sensations of blue (the sky) and of tickling in the nose are rela-

[1] In reality there exists for you much more, as, for example, the feelings of touch or pressure from the skin of your back, your visceral sensations, the dull knowledge of where you are lying and why you lie there, and so forth. But all that is subconscious and we ought not to complicate the matter too much at the very beginning. In reality it all belongs to the " I."

tively simple matters of sight and touch. The image of the flying bird, on the contrary, involves the combination of various impressions of form, colour, and movement, and the image arouses in you an idea, or better, a general conception, of a bird. You have attained this general conception in the course of your life because of the fact that you have seen very many birds. The appearance of the bird before your eyes was what is called in psychology a *perception.* A perception is consequently not only a combination of various sensations; it also involves *representation*[1] or the unconscious (see *infra*) memory of many former similar perceptions. It even involves logical inferences; for when I say, "I see a bird," that is equivalent to saying that the image that floats there before my eyes is similar to very many former images which I have been accustomed to designate by the word "bird."

But what is the image of your bedroom and your handkerchief? This is really closely allied in its nature to that of the bird and the sky; but you know that it lies in you and not outside of you. This image is called in psychology an *inner representation,* and in this particular case the representation is concrete or the representation of a thing. You would not have had this representation if you had not formerly seen your bedroom and your handkerchief; you see them both "in your mind," and the representation

[1] [The German is *Vorstellung*, and in most cases "presentation" would be a more satisfactory translation to psychologists than "representation." But I shall use the latter, as less puzzling to the layman.—TR.]

depends directly upon the memory of previous perceptions of the bedroom and the handkerchief. Thus it is only a kind of inner repetition of that previous perception, by means of a process of memory; and so it can also be called a *memory-image.* Is there then a fundamental distinction between perceptions and inward representations? You will answer: "Yes, of course, for it is certainly a very different matter whether I actually see a thing or only remember it." And the layman will immediately argue: "When I actually see a thing, that is because light waves have struck my eyes; and with recollection that is certainly not the case. Therefore inner representation and perception are fundamentally different."

Clear as this view seems, it is none the less false. To be sure, it is generally the case that our perceptions owe their existence to real external objects; that when we see a bird, hear music, feel a stone, smell a violet, or taste sugar, the bird, the music, the stone, the violet, or the sugar that we perceive is really there in the external world. But this is not always so. For in dreams we often see or feel or hear all sorts of things which do not exist at all in the real world outside of ourselves, but only seem like realities. And that is still more clearly the case with the waking *hallucinations* and *illusions* or false perceptions in which we perceive all kinds of things with nothing at all or something quite different to correspond to them in the external world. If any one is still unconvinced, let him question some one

who has recently lost a leg or an arm. Such a person has all sorts of perceptions of the limb which is no longer there; he feels his fingers—perhaps even has pains in them, although they have long been gone and decayed.

A careful study of these facts proves that the process of perception, like that of representation, takes place entirely within ourselves, and that the two processes are much more closely related to each other than we are generally inclined to suppose. To be sure, perception would not be possible if its elements were never carried in to the brain through the senses. But that is likewise true of representation. We shall return to this soon.

But while you are associating the sensations, perceptions, and representations already mentioned, the thought comes to you that in a short time—say, a minute—you can go to your bedroom scarcely fifty yards away and get your handkerchief. What kind of thoughts are these: a minute, a distance of fifty yards? In themselves fifty yards and a minute are neither real things nor representations of things, but abstract ideas of time and space. We can make an exact mental picture of the room as something that exists in space, even though the picture is only in our minds, but we cannot directly picture a minute or fifty yards. We can do so only indirectly by connecting (or associating) with it representations of things, such as watches or tape-lines. Once it was thought that we could construct abstract concep-

tions by a purely spiritual process. But that was an error. They are built up in the course of a human life from concrete representations of things. The idea " fifty yards " has come into existence as a result of the fact that in the course of our lives we have gone about in space times without number and learned to measure and estimate different distances in a hundred different ways. At last conventional standards, like the yard, were constructed in order to measure off space more conveniently and accurately, and we have gradually accustomed ourselves to these conventions after first becoming familiar with them in concrete forms like the wooden yard-stick. Exactly the same thing is true of time. The idea of time is only an abstraction from the many successions of our experiences, and a minute is nothing more than a conventional measure of time that can be easily fixed with the help of clockwork. I shall not pursue this question any further here, but only state that all our abstract ideas, and especially the whole of mathematics, has been built up step by step merely by the comparison of concrete perceptions and representations of things. Yet we must notice the three main abstractions into the framework of which we divide the relations of all that exists in the external world.

a. The qualitative distinction. We distinguish blue from red, sensations of sight from those of sound, sound from the feeling of hard or warm, this from the smell of violets, and the smell of violets

from a sweet taste. The whole external world appears to us in qualitative differences. Directly, *i.e.*, psychologically, no quality can be reduced to another, not even where this can be done with precision indirectly, *i.e.*, scientifically. For example, psychologically, or directly, we can never transform warmth into force (*i.e.*, the sensation of warmth into the sensation of movement), though physically we can transform warmth into force or force into warmth with great precision. So again, psychologically, we can never analyse the sensation of white into the sensations of its constituent colours, though physically we can analyse the colour easily enough by means of a prism.

b. Time, or the relations of succession between phenomena.

c. Space, or the relations of standing beside each other of different simultaneous phenomena.

Everything that we recognise at all, within us or without us, appears to us in relations of qualitative difference, or time, or space.

2. *The Sphere of Feeling.* As you became conscious of the tickling in your nose and the necessity for getting up, you experienced displeasure. This is called feeling.[1] In psychology it is much more difficult to analyse feelings than sensations and perceptions. They exhibit no space-relations, fill us internally in a very general way, follow each other slowly and indefinitely, and display but few qualita-

[1] [Or emotion, something very different from a "feeling" of touch.—TR.]

tive distinctions. Of these the most marked are pleasure and displeasure, the first with a general release and promotion of the "I," the second with a general constraint and depression of the personality. The feelings cannot be directly deduced from representations of things or from representations of any sort. That there are not only contrasted feelings of pleasure and displeasure but also of excitement and depression and of tension and relief was shown by the psychologist and philosopher Wundt; and this has been confirmed by Oscar Vogt's investigations with the hypnotised.

Taken in general, the feelings can appear independently of perceptions and representations. But nevertheless they are continually associated with them in our minds. A recollection or perception of the words of a telegraphic despatch can call forth pleasure or displeasure, excitement or depression, tension or relief; and, on the other hand, a gloomy mood can call up gloomy representations. Feelings and ideas affect each other mutually. But the feelings are also very dependent upon the general condition of the body, such as sickness, health, or fatigue.

Only through their connection with fine and complex representations are the feelings refined and elevated, as we soon discover in the study of ethics and æsthetics. Feelings with special qualitative colouring, such as jealousy, shame, anger, admiration, yearning, sympathy, and the feeling of duty, are such as have been derived secondarily in consequence

of complicated associations with cognitive elements, even if they are in many ways instinctive, or dependent on definite inherited dispositions (to be discussed later). They often display mixtures of pleasure and displeasure; and they are always bound up with definite objects, according to race, customs, and education. Thus Europeans are ashamed to show their legs, Orientals their faces.

There is a sphere of "bodily," or, more accurately, of visceral feelings, which are more or less indefinitely localised, such as those of sex, anxiety, and hunger. Feelings like these carry with them a vague localisation within the body. They correspond to no definite organs of sense, and yet are not so generalised as pleasure and unhappiness. Thus they form a transition between the sphere of sense-impressions (which give a knowledge of things) and that of general feeling, or emotion. This group of feelings is intimately bound up with the instincts or impulses. Certain visceral sensations, such as those of bodily equilibrium and bodily fulness, are less sharply localised than those of the higher senses and thus show a relationship with the general visceral feelings.

3. *Sphere of the Will.* After the tickling of the nose had given you a feeling of discomfort, and the representation of your room and your handkerchief, through associations of time and space, had suggested the possibility of making an end to the discomfort, there also arose within you associated representations of movement and the resolution to

carry it out. Such resolutions are called acts of *Will;* they are always bound up with the representation of future acts; and when they are formed they set our bodies into motion by means of the muscles.

But as soon as your body comes into movement through the muscles, the situation of all your sense-organs is changed, and with it the stimuli which affect them. In carrying out your resolution you have stood up. Before this, the bird had already left your field of vision. Now you turn your back to the blue sky, and while you hasten to your room there is a succession of pictures of the green meadow, the trees, the house, and the stairs. You hear the barking of the dog and the sound of your own steps; you feel turf and gravel under your feet; the breeze brings odours to you; you feel your own movements, their rate and direction, and all the changes of your bodily equilibrium. In short, the number of sensations which follow each other in time, the pictures of things which stand beside each other in space, the manifold relations of difference which impress themselves upon your perception, are multiplied a hundred-fold now that you have given up contemplative repose and begun to change your place.

This short experiment shows to what a tremendous extent your mental life is quickened and enriched by your bodily movements. But the content of your consciousness is not only increased; the rapid change of relations in what you perceive in space and time

makes it possible for you to make innumerable comparisons between what is given by your different senses. When you see something, you can take hold of it in order to make sure how this something feels. When you hear something, you can go in the direction of the sound to discover its source by sight and touch.

Thus movement enables you to test the perceptions of one sense by another, and to correct all sorts of errors. If one sense should deceive you, or if its perceptions are insufficient, another can correct the deficiencies.

But still further, the movements call forth feelings and resolutions of the will.

When we attend to the matter more closely we soon observe that even without the whole body changing its place, most, indeed all, of our sensations and a large number of our mental activities are caused by movements of the parts of our body, or at the least by changes in the stimuli which affect our senses, as by the flight of the bird in the example given. When the body as a whole is quiet, we still move our eyes, our tongue, our hands, etc. Absolute immobility is scarcely possible, and relative stillness, as everybody knows, is one of the conditions that tend to produce sleep. But more! Every impression which continues steadily for any considerable time without a change in its quality gradually ceases; or, in other words, when the intensity of the stimulus remains the same the sensation diminishes until it disappears

completely. That is a general law: without change, no sensation.

Thus we see, on the one hand, that our resolutions and the actions they lead to are caused by representations and feelings, but, on the other hand, that our feelings and representations are aided to such a great extent by movement that without it their play and change are scarcely conceivable. And if indeed we can think busily even when we are lying very quietly in bed, it must not be forgotten that the content of these thoughts is connected with previous movements and would be scarcely conceivable without them. One cannot imagine the mental life of a human being who has been planted immovably like a tree from the time of his birth. Moreover, when we think, there is a feeling of movement within us. Our thoughts move, so to speak, inwardly.

Strength of will is an ambiguous idea. It implies the ability to form firm resolutions from thoughts and feelings; the ability to convert these resolutions quickly and surely into acts; but, more than all, the ability to pursue an aim, once chosen, with consistent perseverance. Defects in any one of these directions are amply sufficient to cripple the will. Strength of will is very different from impulsiveness and capriciousness.

Through an example from life, we have now come into the heart of psychology and have gained a slight knowledge of its three spheres: (1) the sphere of knowledge attained by working up the sense-impres-

sions which we receive from without; (2) the sphere of common (or general) feeling and emotion in which there is a general emphasising of our central sensibility—something not localised in space; and (3) the sphere of will and movement whose power transforms the elaborated impressions and conditions of the soul into outward action. We observe at once that the first sphere comprehends "centripetal" elements which come from without and lead towards the centre of the soul, while the second appears to be almost purely central, and the third displays "centrifugal" effects, leading *out from* the centre of the soul.[1]

4. *Judgment and Causality.* When I reason from present or past conditions of my sensibility to the existence of certain present, past, or future phenomena,[2] that is called a logical judgment, or inference. Inferences can be correct (*i.e.*, in accordance with the facts), false, or partly correct. No one will doubt that for man the correct judgment of the present and the future (and to a large extent also of the past) is of the highest importance. Such judgment is based upon the law of causation, which says: No effect without a preceding cause. But the law of causation is itself really the law of the con-

[1] [The word "soul" as used here is almost synonymous with "mind." Psychologists often use it when they are talking about feelings rather than about something more strictly intellectual. It has no special reference to one's immortal part. Indeed German psychologists often speak of "the soul" of a brute when they deny that it has any mind.—TR.]

[2] [The word "phenomenon" as used in psychology or any other science does not mean something remarkable, but merely something that can be observed.—TR.]

servation of energy, which says: In the known world of phenomena nothing comes from nothing, and no atom, no spark of energy, is ever lost. Consequently, when something apparently disappears or originates it is only a question of a change of place (movement) or a change of quality. Every form of energy is transformed into another, or arises from another through action and reaction. The former is called a cause, the latter an effect. Instead of cause and effect we might quite as well say action and reaction.

We judge apparently in two ways, inductively and deductively. In an *inductive* inference, or one based on *analogy,* we reason from the frequent conjunction or the peculiar concatenation of certain phenomena to their more intimate causal connection. Example: We have seen time and again that apple trees blossom in the spring, and that from the blossoms little apples are developed which ripen in the autumn. We conclude from this that apples grow on the trees which we learn in this way to call apple trees and not on pines, even though we see them hanging on the latter at Christmas celebrations; and that if we plant an apple tree it will sometime give us apples. Again, if some one has lied to us every day for a year we conclude from this that he will lie to us in the future also, and we do not trust him. But we must note at once, in the first place, that inference from analogy has very indifferent value and can only be made to give a probability bordering on certainty through the most extreme caution and careful

accuracy; and we must note, in the second place, that such inferences are often drawn subconsciously,[1]—a great many sense-experiences are registered in our minds and apparently forgotten and yet used "instinctively" or subconsciously in later life for analogical inferences.

Thus we may be lost in thought and yet travel all over forests, underbrush, mountains, valleys, lakes, and rivers without falling or stumbling or getting drowned, because as we go we constantly avoid all dangerous objects and movements on the strength of conclusions which we draw subconsciously from our former experience. We perform defensive movements (*e. g.*, such as winking or dodging) in the same way to a still greater extent. The judging of what must be done or avoided has become almost as automatic as the action of a machine, and apparently unconscious (subconscious) also.

A deductive inference, in contrast to all this, is an absolutely necessary result of two or more "premises," or propositions assumed to be unconditionally valid; and is absolutely reliable if these premises are absolutely correct. It is really contained in them and stands or falls with them. When I say: 1. All men have a stomach; 2. You are a man; 3. Therefore you have, or must have, a stomach;—that is a *syllogism* or deductive inference of the old scholastic sort. Fortunately we have learned of late to cure cancer of the stomach by cutting the stomach out.

[1] See Chapter III., where the sense of the expression "subconscious" instead of "unconscious" is more fully explained.

So this syllogism is no longer true—there are men without stomachs, and one of the premises is false. But apart from this, deductive reasoning in general has very little value outside of mathematics, because it is only there that one can deal with absolutely correct premises. In the very example which we have given the deduction is merely apparent; for both premises rest on mere induction. Because I find a stomach in every autopsy that I make I conclude that all men have stomachs, and because you have all the visible qualities of the things I call men, I draw the induction that you are a man. The conclusion that you have a stomach then follows of itself, because the stomach belongs to what I believe to be the characteristics of a man, although in your particular case I do not observe it directly.

Because of this question about the premises the whole process of deduction can be false, as we have seen. To be sure, we cannot get along altogether without it. But where the premises are absolutely certain the deductive inferences are generally so obvious that they constitute a mere play; and where the premises are not certain they lead to false conclusions. Consequently complicated structures based on deduction are generally worthless; for a single false premise is sufficient to upset the entire house of cards. Moreover this kind of reasoning outside of pure mathematics trains the human mind to sophistry, the art of concealing fallacies by wordy structures that have the appearance of great exacti-

tude. In mathematics, on the contrary, where the equations, weights, and measures are absolutely correct, deduction is the key to everything. When I say: (1) "The sum of the angles in every quadrilateral figure is equal to four right angles"; (2) "A trapezium is a quadrilateral figure;" (3) "Therefore the sum of the angles in a trapezium is equal to four right angles"; this is an incontestable, absolutely correct deductive inference. And the same is true of more complicated mathematical inferences. They are all completely comprehended in their premises, and these are absolutely correct. Deduction is therefore the logic of pure abstract thought, *i.e.*, of pure mathematics; induction, on the contrary, is the logic of the concrete sciences. In many branches of knowledge, such as physics, chemistry, etc., each helps and completes the other.

Unfortunately the convictions of men really depend much less upon logical inferences than upon other conditions and processes which are very different,—especially the feelings, the emotional tone, blind habit, and imitation. But we must leave this subject of logic and proceed to the explanation of further psychological expressions.

5. *Memory* is an important psychological conception, and consists, so far as introspection or consciousness is concerned, of three phenomena:

a. Any sensation, perception, conclusion, feeling, resolution of the will, or motor impulse once carried out is preserved as a *memory-image* in our minds or,

better, as a pathway in our brains. How? What is this preservation? That is still a riddle. Such a trace can hardly be preserved like a stiff and rigid photograph in the living protoplasm of the brain. Is it a weakened complex of molecular vibrations; does it consist only of slight changes in the disposition of the molecules? We do not know. Moreover the question does not belong here, since it is not one of psychology proper. But it is true none the less that every one of our mental processes leaves behind it some memory-image, some *track* or trace in the memory.

b. The revival of the memory-image. This occurs through the mental phenomenon of association, which affects not only ideas, but also perceptions, feelings, and resolutions. This association is a living example of the connection of two or more conditions of the soul. If I suddenly see an acquaintance, his name occurs to me. The visual perception of the acquaintance has called forth the memory-image of his name through association. But the name (let us say John Smith) is essentially a sound or auditory image (auditory memory). Consequently the perception with my eye of my friend John Smith has called forth through the association of ideas an auditory image unconsciously slumbering in me, and I address him by name. We can say that the slumbering memory-images are suddenly revived or strengthened again through association, and so come once more above the threshold of consciousness.

c. Recognition, or the perception that the revived memory-image is the same as one that we had before. In the example just given I recognise John Smith as the same person that I knew before. Yet in memory recognition may fail. A recollection may emerge without our knowing where it comes from and without our being conscious of its identity with a previous identical incident. Then, to be sure, it is not a recollection in the psychological sense of the word, for the very reason that it is not recognised as such by the subject. Yet we can prove indirectly that it is an instance of memory. Many authors, for example, write sentences or melodies which they suppose to be their own, while in reality they have unconsciously taken them from other works which they have read or heard. Thus while there are no phenomena of memory without *a* and *b*, there can be without *c*.

The following facts or laws of memory must still be fixed firmly in mind.

In memory the former image is never revived with absolute exactness. There is always some falsification or change, even though it be extremely little. Something is lost and something is added. This is largely because the memory-images are called forth again in very different associations, and every new association adds something new and lets something old crumble away. These changes are often so great, especially with certain people, that they disfigure images out of all recognition or even make things appear to be memories which were never ex-

perienced at all. In such cases we speak of *deceptions of memory*. They occur to some extent with every one in the form of exaggerations, etc., though formerly this was not sufficiently recognised. The reliability of memory is very different with different individuals.

The connection of sensations, perceptions, representations, and feelings with each other is called association; the splitting apart of such associated images, dissociation. The oftener such mental images are repeated together, the more firmly are they connected, until at last they fuse into a secondary unity or aggregate (H. Spencer). An original plurality is thus transformed into a psychological unity, which as such can attain a character of its own like the words we perceive in rapid reading. In the same way combined sensations, such as the tones in a chord, melt into one. The process of forming such secondary unities of fused associations can be called, with Wundt, *assimilation*. *Complication* is the name given by the same author to the intimate (mostly subconscious) connection of dissimilar, psychological images, as in the conception "dog," which involves the visual image of a dog, the auditory image of its bark, and the sound and sight of the word "dog." [1]

The more strongly and the more often a mental

[1] ["When the combination is by the juxtaposition in space of the elements, as when different bits of blue make a blue surface, . . . the combination is called *colligation*. When the elements do not exclude the other from occupying the same space, as when different tones combine

process is repeated, the more firmly fixed is the memory-image. Then, too, a frequent repetition of the same set of mental occurrences makes their association with each other so easy that the mental impression they make gets weaker and weaker until at last the connection is so mechanical—so habitual and automatic—and the impression becomes so weak that it is no longer noticed, and disappears from the domain of the ordinary waking consciousness. Thus it becomes actually or apparently subconscious. It is scarcely necessary to add that all impulses of the will to action are also preserved as memory-images or paths of recall, though these motor images remain for the most part subconscious.

From what takes place in memory, perhaps more than from anything else, we can clearly see that that Something which appears to us as a mental condition has corresponding energies and movements in the brain, though these remain hidden for the most part under the threshold of consciousness. A good memory preserves many traces, revives them again easily through association, and easily recognises them.

6. *Attention.* While we are thinking, we can keep only a few mental conditions in consciousness at the same time. I cannot read a book attentively and listen to a speech at the same time, or even think at once of all the contents of the book. Thus at every

to form a chord, or when tastes and smells and touch combine to form the total 'taste' of celery, the combination is called *fusion*."—E. L. Thorndike, *Elements of Psychology*, p. 41.]

moment my conscious mental activity is narrowed more or less to definite thoughts or objects. The more intently I think of anything or attend to it, the narrower is the field of my consciousness. This condition of strong and at the same time narrowed mental activity is called *attention;* and when it is well marked it is accompanied with a distinct feeling of inner effort. If, on the contrary, I allow a set of different impressions to affect my senses without paying any special attention to them or thinking much about them, I can be conscious of a considerable number of them at the same time, though the number is still limited. In this case attention is weaker and broader; such a condition is called *distraction.* In popular speech the term "distraction" is used to mean merely the non-observation or neglect of indifferent things in a condition of intense attention or concentration. If we assume, as is really the case, that the different impressions of our senses and the impulses to move our different muscles take place in different parts of the brain, then attention must be regarded as a movable concentrated maximum or focus of cerebral activity that can be conducted by changing associations from one part of the brain to another and revive memory-images which are always on hand by giving them new force.

Thus we see that the play of thoughts, feelings, and impulses of the will produced in our mental life by what we call the association of ideas is regulated by the activity of attention, which constantly sepa-

rates the false from the true through a conscious or subconscious power of judgment. But here it must be said that by psychological introspection, *i. e.*, by looking into our own active minds, only a small part of the associations actually present are discovered. Most of them are carried on in the deep darkness of a subconscious cerebral activity (to be discussed later) that seems to us unconscious. When I have reached a mountain peak and for the moment am conscious only of the wonderful panorama that I see around me, my mind still knows subconsciously that my body is standing on the edge of a perpendicular neck-breaking precipice and must not lose its balance, that I have but scanty time to get home, that I am hungry or thirsty, and that at home business or wife and children are awaiting me. All these unconscious images in the memory, bound up or associated with the view of the panorama, are effective enough to prevent me from jumping down to get to the beautiful scene. If, on the contrary, I dream of the same situation in my sleep I make the leap and remain flying in the air, because my unconscious associations are at rest or *dissociated.* Of this more anon.

7. *Intelligence.* By the term *Intelligence* we indicate the power of giving proper order and clearness to impressions from the outer world and the ideas imparted to us by others through written or spoken words. An intelligent person seldom misunderstands; he is quick and sure of apprehension, and can therefore not only learn a great deal by heart and

repeat it, which indeed certain idiots with a gigantic memory can also do to an amazing extent, but can also seize it clearly and apply it properly. Intelligence can have different bents. One person easily understands abstract deductions and consequently has a good mathematical intelligence. Another observes well and is especially good at retaining and associating the impressions of the senses; so that inductive reasonings by analogy are more in his line and he has more intelligence for natural sciences. A third has more perception for forms of speech or history or something else. What we call talent is a matter of developed intelligence; but it can be very one-sided. One can be intelligent or full of intelligence in one direction, unintelligent in another. So reproductive talent may be in the field of art, the delicate shading of feeling; or in the technique of movements. One may have good intelligence for music, painting, and gymnastics and very little in the field of knowledge, and *vice versa.*

8 *Imagination* or fantasy is a very different faculty. Memory and intelligence repeat impressions, take them up, and separate the important from the unimportant, the true from the false. But they always move more or less in paths already marked out either by surrounding nature or by other people. They reproduce but do not produce. Accomplished people know how to appropriate, develop, estimate, and repeat the new ideas and discoveries and creations of genius. By *imagination,* on the contrary, we

understand the power—very often connected, to be sure, with accomplishments and intelligence—of making new and independent combinations of mental impressions, of treading new paths in every sphere, untrammelled by the routine of custom and convention, and often in opposition to the learning of the schools and to customary points of view. Imagination is called plastic because it does not repeat what has been given still and unchanged, but moulds new relations like dough and gives everything a new form. Whether it makes the most extravagant leaps, as in a dream, or whether by its combinations it discovers new and hidden truths, it still remains the elf that dances about genius, the glittering fruitful mother of inspiration. In its creative necessity, in the zeal of its struggle with the new and unknown, it often sows rank tares along with the kindliest fruits, and thus gains for itself the deadly hatred of the sarcastic pedants who care only for reproductive intelligence. That is the basest ingratitude; for imagination is the mother-breast at which they feed, and they have no right to malign it. For one creative imagination there are always a hundred cultivated minds to correct its blunders and weed out the tares, so that the field is cleaned up long before new products arise. I speak, of course, only of new products of the imagination, and not of the mummified and crystallised dogmas—of the religious and other orthodoxies—which have arisen from the primitive fantastic imaginations of our grandmothers. The revision and correction

of products of the imagination by intelligence is indispensable.

Imagination is active in two main directions: (1) in the sphere of knowledge, where it investigates, discovers, and broadens what we know in all directions, and (2) in the refinement and harmonising of the feelings associated with sense-impressions and in their portrayal, *i.e.*, in the field of art. The man of mere trained intelligence knows much that others have discovered before him, judges it correctly, and separates the true from the false; but he does not know how to produce anything new from his own head. The investigator and discoverer needs imagination; though if he lets it turn somersaults, as in a dream, without any judgment, then what he sows is mostly tares. But if he has judgment he weeds out the tares from the other products of his imagination and offers his fellowmen abundant useful fruit. The same is true in the field of art. There are artists who are merely intelligent—good copyists, good reproducers of the work of others. But there are also artistic geniuses, who create something new, though if their products contain much trash their art is not beautiful.

9. *Reason.* Perhaps the best definition of this is the ability to form abstract ideas and use them logically. Reason presupposes a harmonious balance of thought, but contains a shade more of it than is implied by the phrase "sound human understanding" (intelligence), which we should really call a sound

human reason. The man of reason also undoubtedly has a bit of healthy plastic imagination, at least in the field of perception. But the great test of reason is self-knowledge—the ability to value one's own powers correctly, without either overestimation or underestimation. Allied with this is the ability to know others—to observe, judge, and estimate them correctly. The man of reason is the man who can accommodate himself best to all the circumstances of life, is always prepared, distinguishes the true from the false as quickly and surely as possible, computes the future correctly, does not make too great demands on life, holds his impulses and passions firmly in check so long as they are likely to be injurious or dangerous to himself or others, and, in short, preserves due moderation in all good things, avoids what is bad, harmful, or dangerous, does not allow himself to get angry or excited, and can manage to take other people and the things of nature as they are, to elude their dangers, avoid their injuries, and turn their interests to his profit. To reason belongs also a correct, well-fitting development of the will and the feelings. Reason is thus *plastic* so that, like imagination, it can be moulded and fitted. But its plasticity is more passive; it is not always forcing itself to make new models; it is modestly content to accommodate itself to those which it meets along its path. In common speech the word "intelligence" is often used for "reason."

10. *Ethics.* By *ethics* or *morals* we should not

understand certain historical or religious dogmatic precepts, like Moses' Ten Commandments. Ethics belongs to the sphere of feeling and is founded on instinctive feelings or emotional excitements of sympathy or fellow-feeling. For it is from the natural ethical feelings of mankind that every system of ethical dogmas has arisen. From his very nature man is, at least to a very great extent, a social being, with sympathy for those who are nearest to him—the wife for husband and children, the husband for wife and children, the children for brothers and sisters and parents. What rejoices one rejoices the other, and what pains one pains the other. The sympathetic feelings spread from our families to our friends, from friends to home, from home to native land, from native land to humanity—yes, even to animals, plants, and familiar objects. These feelings are innate or instinctive in human beings. Any one who does not possess them is a monster, a moral idiot, a born criminal. Certain theorists have tried to build up ethics on selfish interest. But that is a grievous error. No one could lead a creature of mere reason and no feeling to a pure social ethics or morality. But it is no less erroneous to assert, as people often do, that egotism, or the sum-total of self-seeking feelings, stands in absolute opposition to altruism—the moral, or sympathetic, feelings. In an ideal social creature, on the contrary, there should reign the greatest harmony between the sympathetic feelings and egoism; that is to say, every member

of society should find his highest pleasure in the pleasure and satisfaction of others and of society as a whole, as we see in the communities of ants and bees. If this pleasure were as great with men we should have had heaven on earth long ago, and should have needed no laws, no governments, no punishments. But unfortunately the ethical feelings of men are very incomplete; there still lives in us far too much of the beast of prey that finds its pleasure in the suffering of others, or at least satisfies its own selfishness at the cost of others' pleasure. Love thy neighbour as thyself and the Whole more than either; that is the only moral commandment of mankind as it should be. If to this it is added: Love thine enemy, we must reply, so long as there are enemies amongst men no pure, spontaneous social ethics is possible and we have to use makeshifts. There are two forms of ethical feeling: pure love or sympathy, which is a rather pleasant feeling, and conscience, which consists of a set of unpleasurable feelings that rise in us when we injure others or do or wish something antisocial or wicked, and urge us to avoid the wicked or antisocial and to do what is altruistic or social. The feelings of conscience demand that in spite of all disturbing impulses of selfish pleasure we shall do what we call our duty, or what we believe we ought to do for the welfare of others and of society, and leave undone what we ought not to do. It can be seen from this that to fulfil our duty as conscience demands, involves remarkably complex combinations

of ideas, subtile feelings, and voluntary acts. While the feeling of duty is in itself to a large extent a native inheritance, inheritance does not usually tell us what our duty is; that is a matter of education and habit, acquired through moral rules and customs. But there are people whose native composition contains little or no conscience—no sympathy whatever with others or with society. With such moral defectives the tendency to do their duty can only be impressed to some extent through habit, and it is not very lasting.

11. *Æsthetics.* The æsthetic feeling is the feeling for the beautiful. Art is founded on æsthetic imagination, or imagination in the field of emotion. This is not the place to go into the subject any further. It should be remarked, nevertheless, that art finds its foundation or motive mainly in the imitative tendency, then in the desire for self-expression (including, according to Groos, pleasure in one's own movement, one's own song, and so forth,) and in the need for harmony in variety. Intimations of this are to be found even in the lower animals, *e.g.*, in birds. Human art seeks mainly to arouse strong feeling.

12. *Instincts.* These are primitive impulses derived from our brute ancestors and intimately connected with the preservation of the individual and the species. They are experienced as obscure inward feelings and at the same time as tendencies to action. Indeed the feeling and the impulse to action are almost identical. The typical instincts are hunger and

the impulse to eat, thirst and the impulse to drink (water, not alcohol), the feelings and impulses of sex, fear and the tendency to be paralysed or to run, anger and the impulse to be avenged, love and the impulse of self-sacrifice. Feelings are often mixed, like the compound of love or conscience and anger which is sometimes aroused by the bad acts of others. When an impulse goes beyond the satisfaction of the natural needs necessary for the preservation of life and is cultivated expressly for itself and the pleasant feelings it produces, it is called a *passion* (Leidenschaft). Human beings have a vast number of artificial passions which are cultivated by example and habit, and no longer have anything to do with natural impulses; as, for example, many sports and games.

13. *Suggestion.* By *suggestion* is understood a very peculiar kind of psychic (*i.e.*, mental), or, more properly, psycho-physical, reaction, in which an idea —usually connected with a perception—becomes so intense and narrow, the mind becomes so filled with "one idea," that this idea loses its ordinary associations with its corrective counter-ideas, breaks violently through common restrictions and releases cerebral activities that are usually independent of it and generally, if not always, subconscious. Suggestion dissociates what is otherwise associated. Brains in which dissociation is easy are therefore especially suggestible. Suggestion generally releases those activities whose content is such that they can be pictured

by the senses, and does it in such a way that the "subject" is unconscious throughout of the means by which it takes place and is therefore astonished at what happens. Often, on the other hand, an idea leads by autosuggestion to the very opposite of what was suggested. I say to some one, "You are sleepy, you are yawning," and involuntarily he yawns. The suggestion has succeeded and he is already hypnotised. I lay his arm on his head and say to him that it is stiff and he cannot take it down again; and he can not. Now I say, "You see a blue bird flying in front of you"; he sees it. I say further, "You are blind and cannot see anything any more"; he no longer sees. These are all suggestions—sensory, motor, positive, and negative. The negative extinguish and confine. But if I say to some one, "Your head is cool, your feet are warm," and instead of that he gets headache and cold feet, then the case is one of autosuggestion [or countersuggestion]. The conception of suggestion is identical with that of hypnotism;—hypnosis, or the hypnotic condition, is a graduated sleep induced by suggestion. The sleep increases the suggestibility. Yet the mechanism and the results of suggestion are of the same sort whether one is awake or asleep. In sleep the dissociation is general; in the waking condition, partial and circumscribed. Faith, the imitative impulse and all that carries the brain's action away with it and makes one follow blindly—all this carries with it more or less obvious effects of suggestion. Suggestive in-

fluences come mainly from other people, but also from books, things, emotional impressions, etc. To pursue this interesting question any further here would lead us too far afield; and I therefore refer the reader to my book on hypnotism,[1] merely adding that "hysteria" rests on a pathological tendency to dissociation, or pathological suggestibility and autosuggestibility.

14. *Language.* Before we leave psychology we must inquire into the nature of *language* by which man is so far removed from other animals. There is a mimetic or sign language, a spoken language, and a written language. Language is the coinage of thought. Just as coins and paper dollars are symbols and tokens of material value in general, so words and other linguistic expressions are symbols to represent individual ideas, feelings, abstract notions, perceptions, general conceptions, and other single mental conditions or groups of conditions. The word "blue" is a convenient symbol for a colour experience, "love" for a certain emotion; the word "run" is the linguistic coin to represent a group of movement-impressions and experiences, and "bird" is the symbol for a very complex set of experiences from different senses and the kind of "thing" outside of us by which we explain them; and so forth. This same word "bird," or any other, can be represented to the senses through spoken sounds or various written signs or pantomimic gestures, just as the value of ten dollars can be represented by a bill, a gold coin,

[1] Fourth edition, F. Enke, publisher, Stuttgart.

a cheque, or a pile of silver pieces. Language is thus a system of symbols of thought. Since a parrot does not symbolise any thought in its talk, that talk is not speech or language at all. Unfortunately the speech of human beings often contains a good deal of parrot-talk, with no thoughts in the head of the speaker to correspond to his words:

> Denn eben wo Begriffe fehlen,
> Da stellt ein Wort zur rechten Zeit sich ein.[1]

To correspond with thought, languages must provide for the proper inflection and combination of words, and accordingly the science of language is divided into two parts: *grammar,* or the inflection of words; and *syntax,* or the construction of sentences. This shows that the symbolism of language demands very complicated mental work. But without it we cannot do the far more complicated work demanded by consistent abstract thought and its application to feeling and willing.

Language includes not only words and the hieroglyphics of the ancients, monuments and memorials, but also all the arithmetical, algebraic, chemical, and other mathematical and scientific symbols which are used by general consent to represent definite mental processes. Language is thus in the main an artificial product of convention, which has grown out of the natural need of human beings to make themselves intelligible to each other; and now it is so bound up or associated in our minds with our thoughts and feel-

[1] For where ideas are lacking
A word steps in to take their place.—*Faust.*

ings that it is scarcely possible to think without it. The abstract idea "four," for example, is tied up with the written or spoken word "four," as well as with the arithmetical symbol "4."

According to what has been said, every language whatever, whether of sounds, writing, or symbols, has two sides; *speaking* [or expression of any sort], and understanding.

a. Speaking [*or expressing the thought*]. This can be divided into three psychological phases or periods: (1) preparation, (2) diction, (3) articulation.

The *preparation* for speech is simply the disposition or association of the ideas which one wishes to express. To this we need not recur.

The *diction.* By this I mean the particular symbols of speech in our minds—the selection of the coins of thought. Before we can express ourselves either verbally or in writing we must choose words and constructions in our brain from the supply that we already possess. But the words and sentences themselves consist of memory-images of the sounds or written characters which we have perceived by hearing or sight. It is obviously easier to pronounce or write the three letters of the word "dog" than to imagine before us all the dogs we have ever seen or heard; and from that we can see how much language simplifies thought. But if we are to express our thoughts it is absolutely necessary for them to arouse a representation of the motor impulse which is necessary for the production of the spoken or

written word. There are therefore subconscious memories of motor impulses which complete the material for actual diction. We shall see directly that this has been abundantly proved. When the proper expression is once found, the mind or brain must give the order to execute the proper movements, and this execution is called *articulation.* Then the articulation is carried out quite subconsciously (unconsciously for our "I") by the lower nerve centres with the help of muscles and other bodily apparatus (tongue, larynx, etc., or arm and hand). Certain affections of these lower nerve centres can disturb articulations quite as much as muscular paralysis or physical deformities, such as malformations in the bones of the palate; for they cause stammering and stuttering, nasal intonation, and other defects of speech.

b. Understanding. In order that you should understand some one else's language it is necessary (1) that the articulate, verbal, written, or mimetic signs should impress your senses, and (2) call up by association in your brain memory-images that correspond to the thought of the speaker. That assumes that similar symbols such as words and sentences (whether the symbols be verbal, written, or mimetic) call up similar ideas in both minds. This is a bold assumption, but it is necessary for mutual understanding, and is commonly accepted without further ado, though, as a matter of fact, it is generally only partly true and very unsatisfactory. People often misunderstand each other more than they understand, even

when they have both always spoken the same language and the same dialect.

Nowhere better than in speech can we perceive the unity (which we have still to discuss) between brain and mind. Not only when we speak does diction or the choice of motor impulses demand different "centres" or parts of the brain for verbal, written, and mimetic expression (each of the three definitely localised and separated from the other two), but these centres for motor speech are different from the centres where speech is understood. One person may speak out loud, clearly and intelligently, and yet fail to understand what is said by another, though he is not deaf; while a second understands what other people say perfectly well but can no longer express himself, and uses one word in place of another. He notices it, and it annoys him, but he cannot correct it. These two pathological conditions correspond to disturbances in two totally different parts of the brain: the so-called speech centre or centre for motor speech [Broca's convolution], and the centre for mental hearing [Wernicke's convolution]; the former for co-ordinated motor impulses, the latter for the recollection of co-ordinated images of sound. At the same time, both of the patients in question might be able to write without any disturbance and to read and understand writing.

To remember the sound of a word that we have heard is of course not the same as to understand whole sentences and speeches. In other words, there

is a step between the centripetal process of hearing the bare words on the one hand, and the understanding of what is said, on the other; for the latter involves the association of the verbal images—[a central process]. This again goes back to real thinking, and there it is connected with the preparation of the answer.

Thus in language, or the mutual influences of two minds upon each other by means of symbols of thought, we see in action the whole complicated mechanism of sense-organs, sense-perceptions, thought, will, and movement.

We saw above how unreliable our memory is in itself and how our recollections are constantly twisted. Language, especially written language, serves better than anything else to obviate the unfaithfulness of memory. The very words which we use as symbols help to define and preserve the idea and if this is followed by writing or printing, the bottom is taken out of every later deception, so long as ambiguities of expression do not permit various interpretations.

In this short sketch it is impossible to enter upon deeper psychological problems, and I beg every reader who would like to know more to read the *Analysis of the Sensations* by C. Mach, and above all Höffding's *Outlines of Psychology.*[1]

[1] Both of these books are to be had in English. The former is published by the Open Court Publishing Co., the latter by Macmillan. Amongst English books the most brilliant and interesting is undoubtedly the two-volume *Psychology* or the *Briefer Course* by William James, both published by Henry Holt & Co.—TR.

CHAPTER II

ANATOMY OF THE NERVOUS SYSTEM

THE nervous system can be best compared to a beautifully compact little electric plant. The work of the accumulator is performed by the *grey matter* with its ganglion cells (or nerve cells) in the brain, the spinal cord, and the ganglionic nodules, or nervous tubercles, scattered throughout the body; that of the wires by the nerve fibres which are really fascicles or bundles of *nerve fibrils* and are found both in the "centres" just referred to and in the thread-like "peripheral" nerves. These latter must not be regarded as separate parts of the nervous system. They are only direct continuations of the bundles of fibres in the brain, the spinal cord, and the ganglia, which serve to connect them on the one side with the sense-organs which receive impressions and on the other with the elastic muscles through which we make the appropriate reaction. To give some idea of the fineness of this apparatus we can say that the finest nerve fibrils are hardly one two-thousandth part of a millimetre [one fifty-thousandth of an inch] in diameter, while the very largest ganglion cells are scarcely visible to a good eye. A peripheral nerve,

which connects various parts of the body with the central nervous system, consists of a bundle of medullated nerve fibres which issue from the brain, the spinal cord, or the ganglia and continually divides into finer branches. The thickest nerves are thicker than a quill, but their finest branches are not visible. The brain of an adult weighs 1.25 to 1.5 kilograms [2.75 to 3.3 pounds], and so far as mass is concerned the spinal cord and the ganglia are only insignificant and subordinate attachments to it. With the lower vertebrates, on the contrary, the brain is very little more prominent than the other nervous "centres" or divisions of the central nervous system, and sinks correspondingly in significance. With human beings the brain is the organ of the mind and there is far more justification in what we know nowadays for saying, "The brain is the man" than Buffon had in his time for saying, "The style is the man."

To be brief, let us refer to the figures and their explanation. First of all we get a knowledge of the fine, histological elements of the nervous system—cells, fibres, and fibrils—of which the nervous tissue is made up; they are about the same everywhere. The spaces between them are penetrated by very small nutritive blood-vessels, and it all lies in a "supporting" network of exceedingly fine tissue, the *neuroglia,* which, however, does not belong to the nervous substance and discharges no nervous functions.

Like all bodily tissue, nervous tissue consists of cells, and these are generally grouped in *ganglia.*

But these cells possess such complicated tree-like

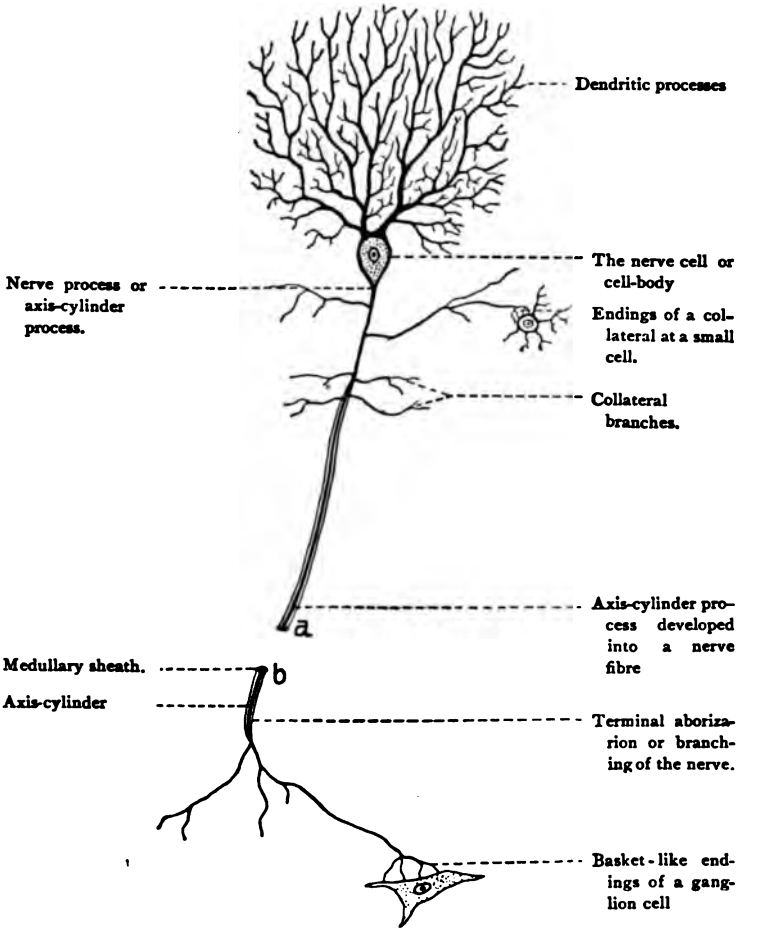


FIG. 1.—SCHEMATIC DRAWING OF A NEURONE
(Cell of the First Category)

branches and such tremendously long fibrous (or filamentous) continuations that the complex whole of

ganglion cell and tree-like fibre belonging to it, together with all the fibrils, has been called by a special name, a *neurone*. What we know most surely about

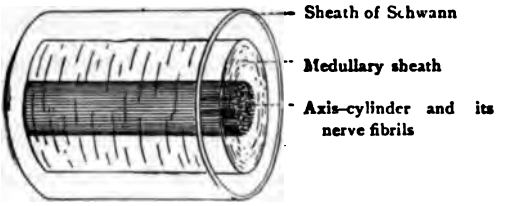


FIG. 2. SCHEMATIC DRAWING OF A SECTION OF A PERIPHERAL NERVE FIBRE, SHOWN IN PERSPECTIVE AS THOUGH IT WERE TRANSPARENT.

The dark axis-cylinder and its nerve fibrils are supposed to be seen through the sheath of Schwann and the medullary sheath. (Enormously magnified and schematic.)

the neurones is this, that when the cell is destroyed all the branches of fibres belonging to it atrophy, and *vice versa*, when the principal fibre is cut out the cell belonging to it, and only that one, atrophies.[1]

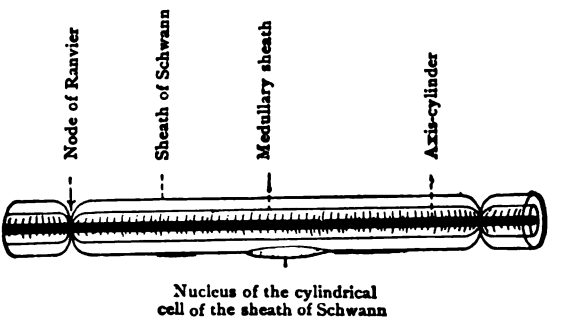


FIG. 3. STRUCTURE OF A PERIPHERAL NERVE FIBRE (SCHEMATIC).

Like other bodily cells, every ganglion cell consists of protoplasm with a nucleus and nucleolus. By protoplasm we mean cellular substance in general.

[1] Forel, *Arch. f. Psychiatr.*, 1887.

The cell has two kinds of continuations or "processes." The first, which are numerous, are called protoplasmic processes or dendrites (Fig. 1). These look exactly like the protoplasm of the cell, and branch thickly like a tree, but they remain relatively thick and end bluntly at a short distance from the cell. But the cell also possesses a single *nerve process,* which is constructed very differently. It consists of a compact bundle of the finest nerve fibrils (Figs. 1 and 4), which surround the nucleus of the ganglion cell like a web, and, as Apathy has shown in the case of the leech, undoubtedly form a network in the protoplasm around it (Fig. 4). In the nerve process itself, on the contrary, the fibrils run along beside each other without branching, directly from the cell to some distant destination (Figs. 2, 4).

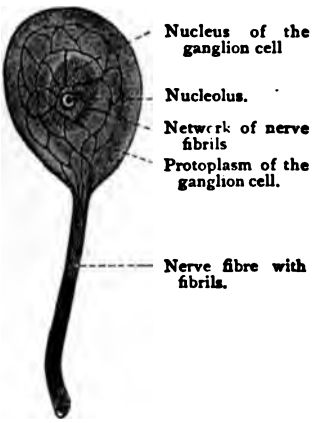


FIG. 4. NETWORK OF NERVE FIBRILS IN THE PROTOPLASM OF A LEECH'S GANGLION CELL
(After Apathy).

This nerve process soon envelops itself in a bright white, strongly refractive, "*medullary sheath*" (Figs. 2, 3).

Ganglion cells are divided into two classes according to the relations of their nerve processes. The first have a purely central function, for their nerve process soon divides and the finest fibrils go to other cells near by, at whose surface they end (Apathy believes that they penetrate into the cells). These are the Golgi cells of the second category.

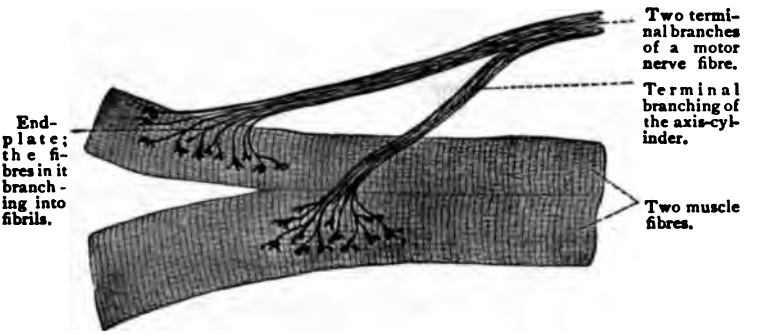


FIG. 5. END-PLATES OF TWO NERVE FIBRES IN TWO MUSCLE FIBRES. Here the nerve fibres are themselves branches of a larger fibre. Their branching fibrils terminate in end-plates. (Magnified about 400 times.)

The nerve process of the others (of the Golgi cells of the first class), on the contrary, gives out a few fibrillar twigs at first, but soon surrounds itself with a strong medullary sheath and then continues without losing it and without branching or with only occasional divisions to a distant, often very distant, destination in some muscle or sense-organ, or perhaps

in a ganglion cell belonging to some other part of the central nervous system. In this long course it bears the character of a "nerve fibre" (Fig. 1). Sometimes such nerve fibres branch once or more in their course, as in the case of the optic nerve. The ends of the fibres, wherever they may be, always branch out like trees, the bundles of fibrils splitting up, and the medullary sheath growing thinner and

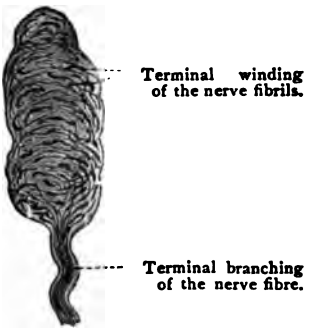


FIG. 6. TACTILE CORPUSCLE (CORPUSCLE OF MEISSNER) FROM A PAPILLA AT THE TIP OF A TOE OR FINGER; THE FIBRILS FROM A SENSORY NERVE ARE WOUND AROUND IT.
(Enlarged about 500 times.)

thinner until it finally almost disappears. Some of these branching ends are rolled up around hair-follicles or papillæ in the skin (Fig. 6); others, like birds' claws, surround the body of other ganglion cells (Fig. 1); others again are buried in the muscular fibre (Fig. 5). From the cells in which they originate to their branching termination the nerve processes must act like insulated telegraph or telephone wires, and the function of the neurones is very

different according to the different organs in which they end.

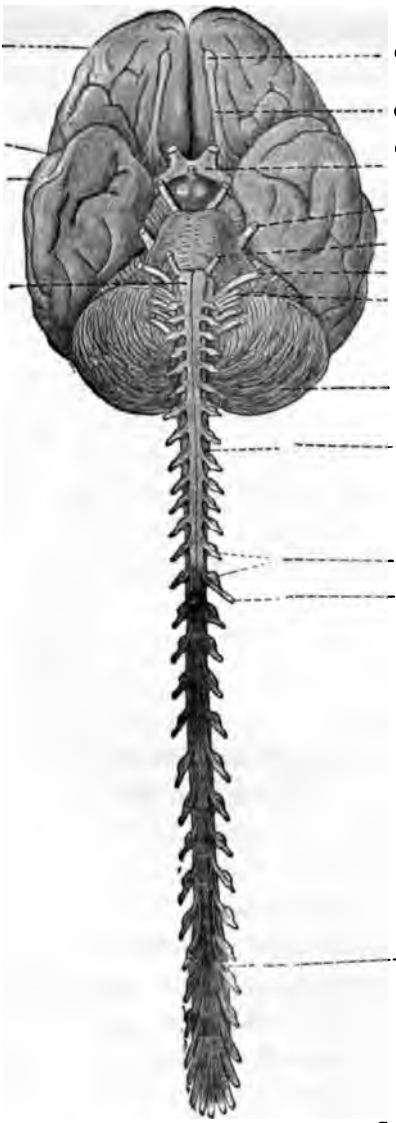
The peripheral nerves and the cells of the ganglia, which lie free in the body and have to stand pressure and tension, are also each surrounded with a tough sheath of connective tissue named after the discoverer the *sheath of Schwann.* This sheath consists of a series of cylindrical cells with an elongated nucleus in each (Fig. 3). At the end of each of these cells of the sheath of Schwann there is a so-called *node of Ranvier* which interrupts the medullary sheath but permits the nerve process to pass through. The nerve process in its medullary sheath is called an *axis-cylinder.* To show how long a neurone can be we will only say that there are ganglion cells in the spinal cord whose processes enter the great nerve of the leg, the sciatic, as nerve fibres and continue without branching until they reach the muscles of the foot.

Apathy, to be sure, has propounded a new hypothesis according to which the nerve processes are not processes of the ganglion cells. He thinks the nerve fibrils are generated in the embryo by tiny *nerve cells* scattered throughout the body, but up to the present seen by nobody but him and Bethe. According to this, the fibrils enter the ganglion cells only afterwards and from without. But this hypothesis contradicts too many facts to be accepted just yet. The uniform death of the neurone when injured in one place is decided evidence to the contrary. So is the

fact observed by His that in the embryo the nerve fibres grow directly out of the ganglion cells. Recently R. G. Harrison has succeeded in destroying the embryological foundation of the sheath of Schwann in the peripheral motor nerves of amphibia.[1] It is from this sheath of Schwann, according to Apathy, Bethe, and the other opponents of the neurone theory, that the nerve cells which are supposed to engender the fibres are derived. But now Harrison reports that axis-cylinders of the peripheral motor nerves were completely developed from the ganglion cells, as His had previously maintained, without any trace of the sheath of Schwann, after the embryological foundation of the latter had been destroyed.

The following fact also is very important. When we count the number of nerve fibres in the oculomotor nerve of a new-born cat we discover that they are approximately the same as in a grown-up cat, although in the latter the nerve is six or eight times as thick. The explanation is that the medullary sheaths are extraordinarily thin at first and increase in circumference with age, so that the diameter of the fibres in a cat four weeks old is almost three times as great as in one just born, and in a cat one or two years old six or eight times as great. If this is true generally, we must suppose that the number of

[1] *Sitzungsber. der Niederrhein. Gesellschaft f. Natur-und Heilkunde in Bonn, 1904.* [See also his more recent article: "Further Experiments on the Development of Peripheral Nerves" in *Am. Jour. of Anatomy, vol. v., pp. 121-131.*]



HUMAN BRAIN AND SPINAL CORD.

One-third natural size. The brain is seen from below, and the cord (which is bent back) from in front.

neurones or nervous elements does not increase from birth to maturity. Moreover it is known that if a hemorrhage or other injury destroys a number of neurones in the brain or spinal cord these are never regenerated; what is destroyed remains destroyed. These two facts agree conspicuously and make it extremely probable that an old man's neurones are the very same ones that he had at birth. I believe that

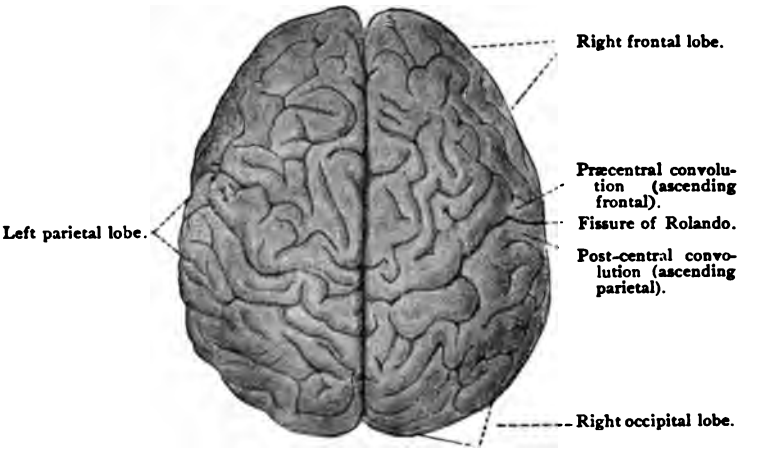


FIG. 8. HUMAN CEREBRUM.
One-third natural size. Seen from above.

these facts are of value for memory. We could scarcely conceive how memory-images could remain in the brain if neurones died out in the course of one's life and were replaced by others. And now how are the neurones distributed in the nervous system? Let us begin with the outside of the body.

Every muscle of the whole body is provided with

nerves, through which its movements are regulated. The principal muscles, which we move by a direct act of will, possess branches from nerve trunks all of which have their origin in a tall column of large ganglion cells, known as the anterior horns of the spinal cord, and these cells and fibres form a vast group of neurones. This column is continued into the base of the brain, where the uppermost cranial nerves, such as the *optic* (the nerve of sight) and the *oculomotor* (controlling the movements of the eye) spring from it. But there is also a great amount of muscular tissue in the intestines, glands, and blood-vessels, which acts quite mechanically or automatically with a peristaltic or worm-like movement (in the intestines) independent of our will and knowledge. These muscles are controlled by the cells of ganglia scattered throughout the body, especially by the ganglia of the sympathetic nerve, with the fibres of which they constitute other systems of neurones. At the same time, all these ganglionic neurones send out collateral branches of thin fibres sideways to the spinal cord or to the brain, through which branches they receive commands from the upper story (from the brain) as the occasion arises and also supply it with news. The ganglia in general constitute, so to speak, colonies of lower animals which vegetate in our body like polyps or jelly-fish and automatically direct the movements of heart, blood-vessels, bowels, uterus, etc. Yet they may receive an energetic impulse from the brain by means of the collateral connections, as when we

blush or grow pale as the result of some perception or feeling.

At both sides of the spinal cord and of the base of the brain there is also a series of *spinal ganglia.* The nervous process of their cells divides like a *T* into two halves, of which one distributes itself about the ganglion cells of the posterior horn of the spinal cord and still further, while the other runs everywhere to the nerve papillæ of the skin, its twigs terminating around these papillæ and around the hair-follicles. These are the nerves of touch, which give us all our sensations of contact, cold, warmth, pain, and perhaps pleasure by sending their stimuli to the brain. The nerve of taste is similar in construction to that of touch. On the other hand, the higher sense-organs of sight, hearing, and smell all possess a highly specialised apparatus. The retina of the eye, the organs of Corti in the cochlea of the ear, and the mucous membrane of the nose possess peculiar ganglion cells with very complicated end-organs for receiving waves of light or sound or odoriferous chemical particles. Another special nerve, the vestibular, which is indistinguishable externally from the auditory, is connected with the *semicircular canals* of the petrosal bone in the inner ear, and serves, according to Mach, for the perception of the body's equilibrium and of changes in its rate of movement; its end-organ also has a very peculiar construction. Thus we see, our whole body is shot through with nervous mechanisms. But all are subject to the direct or (in the case of the

sympathetic system) indirect control of the great mass of the brain; for all the neurones of the spinal cord are directly subordinate to the brain.

The brain and spinal cord of a man, like those of all the mammals, form a coherent mass, consisting of white and grey, delicate, yielding substance. We all have a chance to observe the disposition and arrangement of this substance when we eat calf's brain for dinner. The white substance is composed almost exclusively of medullated fibres such as we have already described, which are woven criss-cross through each other in larger or smaller bundles, and run in all directions. Any fragment of white substance shows a section of this fibrous tissue and contains portions of neurones which often originate in very different parts of the brain and spinal cord and run to still other parts. They are not telegraph wires stretched through the air. No; all the wires run in a thick mass as in a transatlantic cable, though not beside each other, but woven criss-cross through each other, and pressed together like the hairs in a piece of felt. Nevertheless the ingenious experiments of Waller, Türck, and von Gudden, and the workers of their school, amongst whom I have the honour of counting myself, have succeeded in unravelling a part of this tangle of fibres. They destroy a small, definite section of an animal's nervous system, let the animal live a while, and notice any paralyses or other disturbances, then kill it, and after the brain has been hardened in certain fluids cut it up into slices and follow

slice by slice in fibre and cell the track of the neurone which was connected with the part destroyed, for it is now degenerated and therefore distinguishable from the rest. In von Gudden's laboratory we could even observe with the ophthalmoscope the atrophy of a definite part of the fibres of the optic nerve in the eye of a living rabbit, a certain part of whose brain connected with the sense of sight had been removed immediately after birth.

The grey substance of the cerebrum contains the ganglion cells as well as the terminal branches of the neurones. Around all the convolutions and fissures of the cerebrum it forms a ring or "cortex" several millimetres thick, which is pre-eminently the seat of our mental processes, and into which directly or indirectly the neurones of all other parts of the brain as well as of all the rest of the body send nerve fibres, *i.e.*, bundles of the finest fibrils, and which itself sends out branches of neurones. Speaking generally, the long neurones of the cerebrum can be divided, after Meynert, into two groups. (1) The *association systems* through which a ganglion cell of the cortex sends its nerve fibres to one or more groups of ganglion cells in other distant centres of the cortex on the same or on the other side. (2) The *projection systems*, of which there are two kinds: (*a*) the *centrifugal*, in which a ganglion cell of the cortex sends its fibres to the spinal cord or other subordinate nerve centres; (*b*) the *centripetal*, in which a ganglion cell of the spinal cord or of a lower centre sends its fibre

to the cortex. But there is still a third variety, the *short* or *local* neurones (cells of Golgi of the second category), in which the ganglion cell sends the branches of its principal process only to neighbouring cells. From these facts it follows that there is no direct connection between a sense-organ and the cortex or between the cortex and a muscle. Within the central nervous system, moreover, there are complete isolated chains of successive neurones between the cortex and the peripheral neurones. Thus there are various telegraph stations in which the messages are delivered, combined, and then at last sent on farther. The longest uninterrupted neurones are those which run through the *pyramidal tract* from the central convolutions of the cortex to the anterior horns of the spinal cord, and those which lead from the anterior horns to the muscles. These two systems ranked one above the other transmit the combined stimuli of voluntary impulses to the muscles and thus produce voluntary movements.

In the last half century it has been proved both by experiments on animals and by the observation of patients with brain diseases that the stimuli received by each sense are communicated by its set of neurones to a definite part of the brain's cortex, and that *vice versa* every set of muscles receives its motor commands from another definite part of the cortex. This is called the localisation of functions in the cerebral cortex. As we see from Figs. 9 and 10, each half or "hemisphere" of the cerebrum consists of three prin-

cipal lobes, the Frontal, Occipital, and Temporal (or Temporo-Sphenoidal). The middle one above is called the Parietal. The *fissure of Sylvius* separates the frontal and temporal lobes. The optic nerve sends its stimuli to a part of the occipital lobe; the

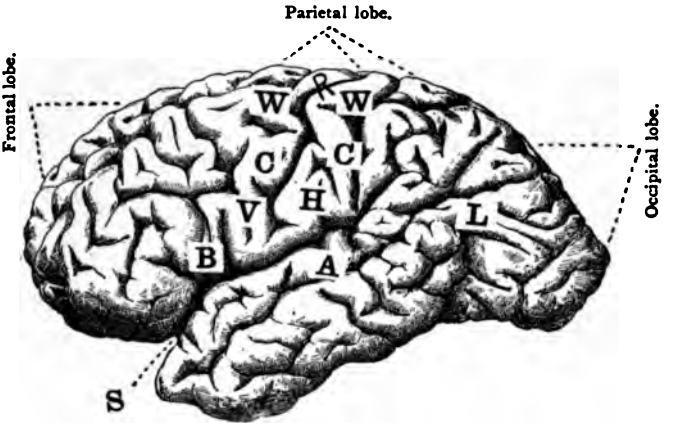


FIG. 9. SIDE VIEW OF LEFT HEMISPHERE OF HUMAN CEREBRUM

R, Fissure of Rolando, or central fissure ; S, Fissure of Sylvius; V, C, W, Praecentral (ascending frontal) convolution ; H, C, W, Postcentral (ascending parietal) convolution; B, Broca's convolution (in the frontal lobe). Injuries here (on the left side) produce aphasia or "motor" aphasia, *i. e.*, they disturb or destroy the power of uttering words; A, centre in the temporal convolution for "auditory speech." Injuries here (on the left side) affect the power of understanding spoken language. A also shows the centre for hearing (for cerebral hearing or mind-hearing) on both sides of the cerebrum ; L, centre for "visual speech." Injuries here on the left side affect the power of reading and understanding written words; W, W, centre for voluntary movements and tactile sensations of the right leg. The corresponding centre on the right side bears the same relation to the left leg ; C, C, Same for arm ; V, H, Same for face. The speech centres, B, A, L, are on the left side only, but with left-handed people they are on the right side only.

auditory nerve sends its stimuli to a part of the temporal; and so with the rest. Between the frontal and the occipital lobes in the parietal region of the cerebrum and separated from each other by the central *fissure of Rolando* are found the "anterior" and "posterior" central convolutions, which with some

neighbouring portions of the brain send out the orders for the movement of individual groups of muscles. Legs, arms, tongue, and other parts subject to voluntary control all have their definite " cortical centres." Some of these are devoted to speech, and contain the apparatus for the understanding or pronunciation or writing of words. The speech area B, A, L, Fig. 9, governs speech in general, and, indeed, in a very com-

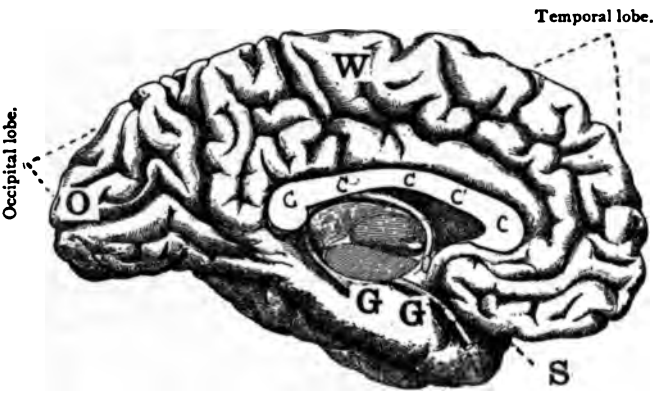


FIG. 10. MEDIAL SURFACE OF THE LEFT HEMISPHERE OF THE CEREBRUM. THE RIGHT HEMISPHERE IS CUT AWAY.

R, Fissure of Rolando ; S, Fissure of Sylvius; C, C, C, C, Corpus callosum, uniting the two hemispheres ; W, Centre for voluntary movements and tactile sensations of the leg ; O, Cuneus, the convolution whose destruction causes blindness (mind-blindness, or cerebral-blindness) on one side of both eyes ; G, Cortical centre for smell (corresponds to what O is for sight and A for hearing).

plicated way, for the destruction of the train of underlying fibres (in the interior of the brain) also injures speech: The three circumscribed regions, B (for the enunciation of words), A for the understanding of spoken words), and L for the understanding of written words), were identified in cases of sharply defined brain diseases which

led to the destruction of brain substance in these places. In this scheme, only those regions are indicated whose destruction involves the disturbances in question most clearly and regularly. But disturbances from B to L on the left side, or underneath, destroy speech in general. Yet after all, we know these cerebral localisations only in gross outline, and on the strength of what we know we should not set up dogmas whose details are built on hypotheses. Thus, for example, it is obvious that there cannot be a definite writing centre, because one can write with any part of the body that is easily moved, even with the foot.

But more: We possess two cerebral hemispheres connected with each other by the association neurones of a transverse plate of fibres (the *corpus callosum*). Most of the projection fibres of the right cerebral hemisphere cross those of the left in the median line of subordinate centres and form connections with the organs of the left side of the body. On this account, when I work with my right hand it means work with the left cerebral hemisphere and *vice versa*. Where both hemispheres are not accustomed to work together it very often happens that in the course of our lives one of them gets a very special training; usually the right hand [and consequently the left side of the brain] gets most of this, and the obvious result is the peculiar fact that we use only the left hemisphere in speech. Consequently the power of speech or diction is destroyed when the left, but not when the

right, inferior frontal convolution (B) is destroyed. The same is true of the understanding of spoken language, whose centre lies in the upper left temporal convolution:—destruction on the left side produces, but that on the right does not produce, *word-deafness*, where the patient still hears the sound when somebody speaks but does not understand it any more than if he were listening to a foreign tongue. In the frontal lobe no other localisation has been discovered; but it seems to be specially active in the work of thinking, *i.e.*, in the combination of memory-images.

Unfortunately the same word "association" is used for the mental processes explained in psychology (the connection of thoughts) and for the anatomical connecting neurones of corresponding parts of the brain. But they are entirely different things, and we certainly have no right to conclude from the sameness of the word that every association of ideas "rides on an association fibre"! It is only through the connection of the cerebral cortex with the senses and the muscles that we know anything at all about localisation; and when it comes to localising the connections between thoughts, the subject is so tangled that we can only make statements about it on the strength of very insecure hypotheses.

In addition to the tracts of projection fibres between the cerebral hemispheres and the spinal cord there are a series of subordinate grey brain centres which have to do more directly with sense-organs and complicated motor adjustments, *i. e.*, with "auto-

matic" acts, and much less with the higher mental elaboration of impressions, and which are stronger or weaker in various kinds of animals according to the development of the functions in question, but many times stronger than in men. Such are the cerebellum, the pons, the corpora quadrigemina, the optic thalami, the striate bodies, the olfactory lobes, etc. The olfactory lobe is connected with the organ of smell; a part of the optic thalamus and of the corpora quadrigemina (but especially the external corpus geniculatum) with the eye. The striate body and the cerebellum appear rather to be connected with phenomena of movement; yet their function is still extremely obscure. When the cerebellum is carefully removed one sees scarcely any disturbances.

To show how tremendously the cerebrum outweighs all the rest in the case of human beings, I give the following figures derived from the brains of ten men and ten women:

Cerebrum		*Other brain centres*	*Total*
Men	1060 grams 2.34 lbs.	290 grams .64 lbs.	1350 grams 2.98 lbs.
Women	955 grams 2.10 lbs.	270 grams .60 lbs.	1225 grams 2.70 lbs.

With these brains of moderately normal people, which I weighed myself, the spinal cord, whose weight is very trifling, was not included. On the other hand, the "other centres" included the projection fibres of

the cerebrum which run through the middle of them. The striate bodies come very close to the cerebral cortex in their significance. We see that a woman's cerebrum is absolutely smaller than a man's by about 100 grams, and also rather smaller than larger even in comparison with the other centres. According to the larger number of statistics adduced by Mercier, the normal average weight of a man's brain is 1353 grams [2.98 lbs.], of a woman's 1200 [2.64]; so that the average difference is still greater.

We must be content with this short and incomplete sketch of the human nervous system. But we see from it that the organs of mind are constructed from the same tissue as the organs of all our other nervous functions and the organs of movement except the muscles themselves, whose elasticity like that of india-rubber makes them a good instrument for the nerves to work with. Nay more! We see from language, movement, and sensation that the action of two or more groups of neurones is similar enough to carry over the most subordinate stimulation of any part of the body into consciousness (in the cerebrum) or, *vice versa*, to carry a "movement" within consciousness into some sort of muscular action.

It is evident that all these transferences and strengthenings (or "reinforcements") and arrests (or "inhibitions") of stimuli correspond to an intense molecular activity of the nerve substance, which expends its force and exhausts its material; and this makes it necessary to replace both matter and energy.

This indispensable energy is now brought to the brain or other centres through an extremely rich network of blood and lymph vessels, richest of all in the grey matter.

The brain and spinal cord are well protected and concealed in their hard casings of skull and vertebræ; but when these are broken or injured the consequences to human minds and brains are most serious; for the central nervous system is as delicate as it is powerful and cannot stand a severe injury to the bony envelope that protects it without grave disturbances of its functions.

CHAPTER III

THE RELATION OF THE MIND TO THE BRAIN

IN the first two chapters we gained some knowledge of mental phenomena and of the structure of the nervous system, and in this connection we saw that the brain is the true centre of mental action as well as of nervous action in general. One fact here is very peculiar: although all our conscious feelings are in the cerebrum, injuries to the cerebrum itself are not painful; indeed they are not felt at all. Thus sensation and pain, so far as we are conscious of them, always correspond to processes in the cerebrum which are caused either (*a*) by stimuli present somewhere below the cerebrum, or (*b*) by other processes in the cerebrum itself in response to stimuli from nervous mechanisms further down. In other words, sensation and pain as well as perception correspond to definite stimulations of the cerebrum; but these stimulations can only be produced in two ways: first, through the transmission to the cerebrum of some particular set of stimulations from bodily nerves or from subordinate centres in the spinal cord or the ganglia, or second, through an excitation of a memory-image by any associated activity within the cerebrum itself.

The second case is rather abnormal, however often



it may occur. For the end of sensation, pain, or perception is to direct our attention to what is going on in the outer world. Accordingly the brain is accustomed not to locate these in itself, but in the place outside where they are ordinarily caused. We locate the fountain that we see, on the street; the voice that we hear, in the person speaking; the burning pain from our finger, in the finger; although in reality it is only the causes of these processes which are outside, and they themselves take place in the brain. Then when similar processes arise through an inner stimulation of the brain we have an hallucination of a fountain or hear a voice or feel a pain in the finger when nothing of the sort is present at the place in question; no, not even in the finger. We are simply deceived (as in the case already referred to of the man with a pain in his amputated foot) and "project" outward what is taking place in the brain without an outward cause. Innumerable pains of so-called *neurasthenics* (hypochondriacs) arise in this way. It can be accepted as highly probable that in all these cases the same neurones are affected which normally carry the stimulations from without to the cerebral cortex; hence the deception.

It is peculiar what intense pain all animals express when their "sensory" or afferent nerves are torn, not only at any point along their course but also at their point of origin in the ganglia (for example, in the ganglion of the optic nerve, the *Gasserian*) and higher up in certain parts of the spinal cord and the

medulla oblongata (at the base of the brain). When we consider the leading part played by these latter organs in the case of those lower vertebrates which can express pain vigorously and yet possess only a very scanty cerebrum it seems extremely probable that these subordinate centres were originally capable of feeling for themselves—and especially of feeling pain (see Chapter IV. on Goltz's dog without a cerebrum). And so it seems to me that the insensibility of the cerebrum to the tearing of its own substance can be explained in this way: The cerebrum was developed in the higher animals after the rest of the nervous system, and as a result of its protected position it has only had to feel in a secondary way from the very beginning, *i. e.*, has only had to work up the stimulations and neurokyms of pain and other feeling complexes transmitted to it from lower central nervous mechanisms. Perhaps this will be unstood better later.

But what is the real relation between our inner mental processes and a stimulated condition of our brain?

Here we must express ourselves plainly if we are to be understood. Almost all the mental processes mentioned in the first chapter are, as they say, "subjective," or perceptible by every individual in his own self, or ego. These processes form the subject-matter of psychology, the science of mind. By the very word "conscious" we mean that something or other —some sensation or idea—forms a part of our mental



content. According to that, from the standpoint of pure introspective psychology, what is not conscious or at least was not once conscious should not count as a mental condition or process. As the contents of consciousness we may designate all present or past mental processes in the sense just explained. *We have no direct knowledge of anything at all but mental processes or contents of consciousness.*

But, as we have seen, this direct method has a way of often deceiving us. We have seen already in the first chapter how what is brought to consciousness by one sense is corrected through judgments based on the other senses and on movement, is fixed by memory, improved by continuous parallels in life and always shaped more correctly. And so, because experiences from the outer world are continually enriching our consciousness and are made to fit reality better and better, we indirectly gain a more exact knowledge of that outer world. We compare the symbols—the sensations and perceptions—of one sense with those of another, and through this comparison errors correct themselves. In this way we gain a higher kind of knowledge, the beginnings of science. Such knowledge we call "objective," not because it is an external reality in itself, but because it represents the adjustment between different sensory impressions made by the outer world upon our brain. The impressions of the outer world arrange and correct each other in our brain of their own accord so as to correspond with their proper order.

Through such indirect processes we gain perceptions of the regular occurrences in the outer world, provided that our brain works normally, *i. e.*, is properly fitted to its task. When such regular occurrences appear to be sufficiently assured by means of inductive inference [1] we speak of laws of nature.

The formulation of the "natural laws" of science is thus a result of the regular action of the external world upon our brain. But the brain itself can be regarded from two sides. It is the organ of the mind, the subject, the ego. But at the same time it is a part of the external world which we can know indirectly from without, at least in the case of our neighbours. We may briefly designate the mental or inner side of our brain life as *Consciousness,* and the side which is observed by others from without as *Neurokym* or nerve waves. And now we must make sure of two facts:

1. Each individual knows only his own consciousness, but he concludes from the communications which are made to him by means of the coins of thought of which we have already spoken, *i. e.*, by means of language in the broadest sense, that his fellow men and the higher animals have consciousness too.

2. The direct translation of what is contained in consciousness into neurokym or *vice versa* is something impossible, or rather, transcendent, *i. e.*, beyond human powers of knowledge.

And yet it is absolutely established on the ground

[1] See Chapter I, above.

of experience that if we understand by mind something that corresponds to our human consciousness, there is no mind[1] without the living complexes of neurokym, *i. e.*, without the brain. It is quite as well established that for every inner process of the mind there is a corresponding nervous process in the neurones of the brain. On this all serious psychologists and physiologists now agree.

But apparently this is not true of the converse. There are very many activities of our brain and nerves of which we are not conscious, and which we indicate accordingly by such expressions as "unconscious," "automatic," "reflex," "mechanical," and "instinctive." To understand this we must discuss something different.

If any one pays attention to his dreams he soon notices that if he fixes his mind upon them at the moment when he awakes and goes once more as well as he can through the dream-chain which he has just ended, he gradually succeeds in calling back more and more of the images and in fixing them in memory, however dissociated, or incoherent, they may be. If, on the contrary, he does not attend to his dreams he comes to forget them altogether, especially if his sleep is short and deep; so that he imagines he does not dream at all. Thus it is established that certain chains of mental processes give us the impression of unconsciousness though we can prove indirectly that

[1] [Certainly no mind that we can know anything about in this earthly life.—TR.]

they are conscious; for the dream-consciousness is also a consciousness, or something known by introspection. In so-called *somnambulism,* or sleep-walking, we can even accomplish quite complicated performances and have very orderly chains of thought, which we erroneously describe as unconscious because we do not know anything about them. Hypnotism, into which we cannot enter here, gives us very definite proof that perfectly similar mental phenomena may occur either consciously or, at least apparently, unconsciously. Nay, more: I have succeeded experimentally in influencing the perceptive centres of hypnotised persons, so that certain stimulations, such as sounds, pricks, etc., were not perceived at the moment of their occurrence; the "subject" did not perceive them at all. Nevertheless these impressions were registered in the brain, for afterwards by a suitable suggestion, which however contained nothing as to the character of the phenomena in question, I succeeded in making these proceedings enter into consciousness, so that the subject described them exactly and thus remembered something of which he was not conscious at the moment of its occurrence. He became suddenly conscious of a past of which he had remained till then unconscious. Oscar Vogt has confirmed this.

All these facts show unambiguously that "unconscious perception," "conscious performances," "forgetting," and in general a whole series of allied phenomena can be briefly designated as cases of *men-*

tal dissociation, i. e., as processes in which the conscious connection of mental conditions is split or broken off, with the result that for the time being the extent of what we have in consciousness is very limited. And even if memories enable us to call back quite a large part of past conscious possessions, this power is still very limited.

From such considerations we can draw the very important conclusion that a large number of mental processes are erroneously designated as "unconscious," for they were conscious nevertheless, and may be conscious even now in a separate part of our brain life, while our attention is directed to other things. Amnesia, or forgetting, rests on dissociative processes and often simulates unconsciousness. A child learning to read is conscious of every stroke of the letters; but we adults are not even conscious of the whole word which we glance at in reading. On the other hand, we assume that even a fish running away at our approach is conscious of the approach of an enemy; and yet a fish's brain is more simply organised than our most subordinate brain centres (such as spinal cord, or cerebellum), the activity of which is always unconscious to us. How can we reconcile all these contradictions?

I believe that a very simple supposition, which we have a right to make so long as it cannot be shown to be false, helps us easily out of all our difficulties. Let us suppose that all nervous action, *i. e.*, that every neurokym, possesses an inner or introspective side,

however slight and elementary. This inner side is nothing in itself; it is only the inner reflection of the molecular nerve waves. This inner reflection or consciousness (or, if you like, this fragment of consciousness) follows the psychological laws mentioned in Chapter I. Now if we use the term "*Superconsciousness*" to designate what we ordinarily mean by consciousness, *i. e.*, the very important syntheses or connected series of recallable conscious states that we have when we are awake and our attention is concentrated, then the content of this superconsciousness forms the main part of our mind, or ego, or inner life, and therefore the main content of psychology. We can then use the term "*Subconsciousness*" to designate those states of which we were once feebly conscious, but whose connection with our superconsciousness was either always very incomplete or immediately broken off again, as well as the presumable continuation of such phenomena in the activities of our brain, which we usually regard as unconscious. The more or less inadequate glances which we have already taken into this subconscious life of our mind lead us to believe unhesitatingly in its presence; and as a type of such subconsciousness with dissociated content we can adduce the consciousness that one has in dreams and in somnambulism. But if our view is correct we must undoubtedly go further and suppose that there is a subconsciousness lying still deeper which is never associated with our superconsciousness and which is the inner comple-



ment of activities of subordinate nerve centres, ganglia, etc. What it is like inwardly, of course we do not know, any more than we know the thoughts and feelings of a lower animal. I shall try to make the matter clearer by a comparison.

Let us imagine an immensely complicated machine, and imagine further that all energy and movement, and therefore all the energy and movement of this machine, has the property of feeling itself. It is clear that the feeling of the machine will bear some relation to the complexity of its activities, and that therefore the feeling of the machine as a whole will be much more complex than that of a single atom of matter moving along in a straight line. Let us imagine further that wave movements of electricity, sound, or warmth, which take place in the machine, involve corresponding compound feelings, and that these vary in quality according to the rapidity or slowness, length or shortness, and other relations of the movements; that is, that where a definite rhythm of the waves, say a very short one, is present, there is a single feeling for the whole group of waves involved; but just because they are all acting together in this particular way the feeling has a different quality from that which corresponds to a single wave or even to a set of waves with a slower rhythm. In this way qualities of feeling arise which an atom moving along by itself cannot possess. But does this give us the right to deny a feeling of its own to the single atom? Certainly just as little as the greater sim-

plicity of its movements gives us the right to deny it movement and energy.

In some such way as this I represent to myself the distinction between our own consciousness and that of a neurone or cell or atom. In this way I get out of the clutches of the mystical dualism between mind and body. In this way too we can explain the apparent contradictions, to which we have referred, in the phenomena of human consciousness. Just because there is a synthesis of the machine's feelings this united higher feeling of the larger complex movements loses direct subjective connection with the feelings that belong to the movements of the individual molecules. The latter must thus appear to the higher or more developed synthesis as "unconscious," yet they are really conscious for themselves, *i. e.*, subconscious.

Consciousness is thus in itself something quite different from the complications, the intensity, the plasticity, or the automatism of a movement; and yet these latter properties are reflected in it.

On the conscious or subjective side, although the movements [of the machine or its parts] are really united and therefore simplified by synthesis, yet on the whole they are known introspectively as they are —the simple as more simple and the complex as more complex. The formation of qualities which arise through synthesis is obviously a peculiarity of the subjective side of energy which is not capable of further analysis. Thus, for example, certain shorter

light waves appear to us as violet and longer ones as red.

Is this conception of ours a useless speculation? Does it mean anything to ascribe to every nervous activity an introspective side, or if you like, a fragmentary psychology? Let us see.

In Chapter I. we mentioned the law of the conservation of energy. This law, as you know, forms the foundation of natural science. If we trace the actions and reactions of the neurokym in the central nervous system, we find there nothing but a chain of movements completely subservient to the law of conservation. But if we observe our mental states from within, simply for themselves, they appear not to obey the law. In the mind great activities arise apparently from nothing and vanish again into nothing; at least we certainly cannot discover the cause of all conscious states in other conscious states. And it was from this very fact that people formerly inferred the presence of a soul independent of matter and of the law of conservation. But the whole puzzle and all the contradictions are explained with perfect satisfaction if we suppose, what the phenomena already mentioned so readily suggest, that the causes of our superconscious cerebral life are to be sought to a great extent in past or present dissociated, or generally subconscious, activities of the brain, and that in general all inner life, all consciousness in itself, is nothing but the inner side of the neurokym.

This has already been pointed out by the older

philosophers, such as Spinoza, and especially, in more recent times, by Fechner; and the conception which explains it all may be called the hypothesis or law of *identity*.[1] It simply says that what appears to us psychologically as mind and physiologically as neurokym is one and the same thing. Fechner has expressed himself directly to this intent:

> The physiology of the nervous system (the science of the neurokym) and psychology (or the knowledge of mind) deal with the same material seen from two different sides, and there can be no more strife between them than between the observer of the convex and the observer of the concave side of a curve. Every phenomenon of consciousness gives occasion for a double investigation. Now the psychological and now the physiological side of the phenomenon is most easily approached; but this does not destroy the fundamental relation of the two sides to each other.[2]

We call the reality of things "objective" or observed from without; but it is really, though indirectly, subjective. It rests on inferences from analogy, but often on very certain inferences which we gain by the comparison of sense-impressions and the correction of one by another which we make as a result of our experience in life. A simple example and a little reflection will make the matter clear.

When I say that I see and feel an apple in front of me I am not deceived, for I have proved hundreds of times that when I see an apple I can also feel it and

[1] [To be distinguished, of course, from the logical law with the same name.—TR.]

[2] After Höffding.

that when I eat it I know it by taste into the bargain. The pathological case of hallucination or false perception only confirms this rule; for the reality of the object is denied by other people who confirm my other perceptions. Of the assumed real "being" of the apple I know, to be sure, only the impressions of touch, taste, sight, and smell which it makes upon me—only symbols. But because of the stability of their mutual relations, these are fully sufficient to make me certain that there is a real thing corresponding to them in the external world, which I call an apple. All the expedients of science such as measure, weight, number, are only conventional abstractions which men work out from the comparison of real things known in this way. Nevertheless I can never transform sensations of sight into those of taste or touch. In this way, these sensations are dualistic or even, in a qualitative sense, pluralistic, because I cannot subjectively transform the specific energy or quality of one sense into that of another. Yet I am justified in ascribing a definite combination of sense-impressions, "the perception of the apple," to a real thing—to the apple which I rightfully "project" into the external world. But the seen, the felt, and the tasted apple are the same thing; my experience vouches for that on the ground of innumerable inferences from analogy.

If now I place an apple beside a pear I have before me two different things. And if I eat the apple, it lies in fragments in my stomach and no longer in

front of me, though the pear may. ***But I can not eat the visual image of the apple or leave its tactual image in front of me.*** Yet that image is as clear as day, and at the same time the best proof of the presence of the real thing outside of me. For this reason I call the seen apple *identical* and not *parallel* with the one that is felt and tasted.

The same is true of mind and brain. It is as impossible to imagine a living brain without a mind as a mind without a brain. What destroys the brain destroys the mind, and what disturbs the brain disturbs the mind correspondingly. The two are as inseparable as the apple seen and the apple felt or tasted, and correspond in the same way to the same real thing. And that is why we speak of *identity* and not, like certain modern psychologists, of *parallelism;* for a thing cannot be parallel with itself. Again the visual image and the tactual image of the apple, *as mere images*, are certainly not parallel; and no more are the ideas which we find within us and the groups of physiological neurokym that go with them. In these questions we often only quarrel about words because we have a way of confusing theoretical abstractions with real things.

Thus we see clearly how we must apprehend the relation of the mind to the brain. Both are really one. But we have two ways of investigating this brain-mind: psychology or inner experience, and physiology or observation from without in connection with appropriate experiments. Neither of the

two should be neglected. By physiological psychology we understand the study of the relation of the outer phenomena to the inner and of the inner to the outer. The investigations of the last decade, continually more fundamental and profound, show more and more that all mental phenomena are only the inner side of brain activities. Thus they confirm the identity hypothesis, and allow us gradually to penetrate deeper into the laws of the mental processes. But, on the ground of what has been set forth above, we can say quite as well that all brain activities are only the outer side of mental processes. That amounts to exactly the same thing.[1]

From the standpoint of psychology, or the study of the mind, we must state that dualism, which supposes a mind independent of or separable from the body, necessarily leads us to insoluble contradictions and this for the following reasons:

A mind conceived of dualistically must be thought of either as dependent upon, or independent of, the law of the conservation of energy. If it is thought of as containing energy [*i.e.*, as subject to the law], dualism is only playing with words, for a mind obedient to this law and yet "independent of the body"

[1] The identity hypothesis or scientific monism leads easily to a monistic conception of the world, according to which God and the world are regarded as one and the same unknown Omnipotent, because the idea of God existing apart from Nature assumes that God and man are alike, and that man's mind is independent of natural laws. It is not our business here to meddle with metaphysics, world-views, and religion, and we must say at once that such questions are quite beyond the sphere of human knowledge.

can only be a portion of the brain's activity which we involuntarily tear from its connections and to which we lend "mental being" only to demand it back again immediately. Energy can be transformed only qualitatively, not quantitatively. In order to be able to obey the law of the conservation of energy a dualistically conceived mind would therefore have had to be able to pass over completely into another form of energy; but then this mind would be no longer dualistic, *i. e.*, no longer different from the brain activities or from the energy in general of which, as we saw, we can very well regard consciousness as an immanent property. But if the mind is thought of as without energy, *i. e.*, as independent of the law of the conservation of energy, then we come immediately to a belief in miracles that abrogates natural laws and allows them to be disturbed at pleasure; and energy would have to arise from nothing and return to nothing every moment, through the intervention of miracles, spirit rappers, and materialised ghosts; for the action of the mind on matter and *vice versa* could certainly not be disputed. Thus we should have a constant falsification of the law of conservation, and it would then be wrong. But experience teaches that it is right and that the mystical appearances which are again and again brought up against it will not stand the test of exact examination, but vanish as fog and illusion, often also as fraud. For us, of course, the "mind" does not act on the "body," but the cerebrum acts on other

nervous mechanisms and other parts of the body, and *vice versa.*[1]

[1] [Doubtless a good many readers will find it difficult to admit the force of all that is said in the last part of this paragraph. One need not necessarily be a monist in order to disbelieve in spirit-rapping and materialised ghosts. But whatever one may think about the argument or about any part of it, it is very easy to see the immense value of the monistic standpoint in the discussion of mental hygiene.—TR.]

CHAPTER IV

PHYSIOLOGY OF THE NERVOUS SYSTEM

PHYSIOLOGY is an account of the functions or life of the organs of a living being. Formerly the structure of the brain was only known very badly and consequently most attention was given to the physiology of the peripheral nerves, which however reveal only very elementary processes of the nervous life. We shall try to present the most important physiological conceptions.

1. *The Muscle.* The fibrous muscle cells consist of contractile particles. When a muscle freshly cut out of the body is irritated mechanically with a needle or chemically with an acid, it contracts, *i. e.*, becomes shorter and thicker without altering its total volume, and relaxes again when the stimulus is withdrawn. And if the nerve whose fibres are distributed through the muscle is cut out with it and then stimulated in the same way at the cut end, the fresh muscle contracts as before. Thus the nerve, without moving itself, can transmit a stimulus to the muscle.

But it is certain that a direct stimulation of the muscle, without the aid of the nerve, is sufficient to cause its contraction. For ammonia, which does not

affect the nerve, will make the muscle contract, and, on the contrary, the poison curare paralyses the motor nerve and not the muscle.

The nerve which we stimulated, in the supposed case, can communicate to the muscle only that rude, uniform, or indifferent stimulus. But since every separate nerve fibril ends, as we have seen, in a different part of the muscle, it is possible for an extraordinarily fine harmonious combination of stimuli of different strengths in different fibrils and bundles of fibrils to cause a correspondingly fine and harmonious combination of muscular contractions, and thus lead to harmoniously combined movements of the bones and cartilages to which the muscles are attached by sinews. When the nerve which moves the muscle of a living man or animal is severed, after a short time the whole severed end of the nerve dies, and then the muscle dies too and shrivels up. Thus we see the tremendous extent to which the muscle depends upon the nerve.

2. *The Nerve and the Neurokym.* From the facts described, as well as from the fact that sensory stimuli are conducted to the brain, it clearly follows that within the living nerve—really in the axis-cylinder, or nervous process of the ganglion cell—there takes place a wave-like molecular movement, which we have called neurokym, and which is transmitted with extraordinary rapidity. In the case of the motor nerve the rate is about thirty metres [say one hundred feet] per second. The rapidity of trans-

mission in a sensory nerve is very hard to measure; the estimates vary between twenty-six and two hundred and twenty-five metres per second. With lower animals the transmission of the neurokym is much slower and very variable. The experiments of physiologists have shown that the same nerve can transmit a stimulus in either direction. But commonly the motor nerves conduct in a *centrifugal* direction, and the sensory nerves in a *centripetal.*

That each nerve fibre conducts a separate current, like a telegraph wire, is certain; otherwise the finely distinguished stimulations of muscle fibres and the finely distinguished conductions of separate sense-stimulations would be impossible. But within the insulated nerve fibres the nerve fibrils must also be insulated, at least to a great extent. Otherwise the fine play of nervous life would be inconceivable and the finely branched unbundling of both ends of the nerve fibres into their fibrils, meaningless.

And now what is the nature of the neurokym, or nerve wave, which is transmitted in the nerve fibrils?

Certain it is that the excitations of the outer world, which strike the senses, are transformed into energy and stored up within the central system, and that conversely this energy of the central nervous system is converted again into muscular movement. The neurokym cannot be a simple *physical wave*, such as electricity, light, or sound. If it were, its exceedingly fine, weak waves would soon exhaust themselves without causing the tremendous discharges

which they actually call forth in the brain and out from the brain in the muscles. We must therefore suppose that on its way through the neurones the neurokym liberates new forces, and this might well take place by means of fine *isomeric* chemical processes which transmit themselves in waves, the chemical changes being repaired immediately after the waves have passed but setting up a change in the next part of the nerve. According to the molecular condition that this "chemical wave" confronts at the end of its neurone, the stimulus can then be either strengthened or extinguished. These are only hypotheses; for the actual nature of the neurokym is not known. But von Bunge is certainly quite right when he says in the first volume of his *Text-book of Physiology:* "Only the most intimate union of mechanics and chemistry can bring us nearer to the solution of the riddle. The mechanics of the chemical elements—that is the physics of the future." This is as true of neurokym as of the physiology of the muscles, and Bunge's words agree with the view which I expressed in 1894 in my lecture on brain and mind.[1]

Above all, the supposed chemistry and mechanics of life itself, *i. e.*, of the cell-protoplasm, is something of which we know simply nothing. We observe facts, or appearances, and seek their laws. In this reference the new book of Richard Semon's [2] makes

[1] Emil Strauss, publisher, Bonn.

[2] *Die Mneme als erhaltendes Prinzip im Wechsel des organischen Geschehens.*" See *infra.*

a very real advance in the conception of vital processes, especially of those of the nervous system. By *engram* Semon understands that which we called in Chapter I. a memory-trace or memory-image, but not only as something in consciousness, rather as a general phenomenon of nature. Thus everything that one inherits consists of groups of engrams. In this Semon proceeds from the ingenious thought of Hering, who regarded all instinct as a kind of memory. Every engram always consists of complexes of simultaneous or successive stimuli. By *ecphory* Semon understands the power of an engram to afterwards call back or revive engrams which arose at the same time with it, or to arise again itself in the same form that it had before through a similar but weaker stimulus. Thus ecphory corresponds to association. Yet these notions are taken in a much broader sense, and in the next place they are independent of introspection [*i. e.*, of purely conscious phenomena], or rather use the latter only as helps. Mnema is the sum of the engrams which an organism has inherited or acquired for itself. The reader is referred to the original work, which really contributes to the understanding of the organic process.

3. *The Reflex.* If we cut off a frog's head, of course its brain goes too. And now if its skin is irritated the foot makes a defensive movement. This movement can only be transmitted by the spinal cord, into which runs the sensory nerve and from which runs the motor nerve. In order to make possible



these reflex movements it is sufficient to leave a small excised bit of the spinal cord connected with the corresponding sensory and motor nerves,—*i. e.*, with the nerve from the skin or other sense-organ and the nerve to the muscle; but so long as the spinal cord remains connected with different parts of the skin and muscle of both sides of the body, the stimulation of one part may call forth movements even on the other side of the body.

This phenomenon is what the physiologists call *reflex*. The conception of reflex implies that it takes place mechanically, involuntarily (apparently unconsciously), and always in the same way when the stimulus is the same. When a person crosses his legs so that one hangs over the other and then some one gives it a sharp blow on the tendon below the knee-cap, the result is a knee-jerk or *patellar reflex*, unless it is prevented by a strong muscular tension, and the foot makes a sudden involuntary kick. A certain sickness, in which some of the bundles of fibres in the lumbar region of the spinal cord are destroyed, completely destroys this reflex; and this proves that the stimulation of the patellar tendon is transmitted from the sensory nerve to the motor nerve of the leg by means of this part of the spinal cord (the zone of Lissauer). This, then, takes place without the mediation of the brain. The contraction of the pupil of the eye in the light is another such reflex, and there are a great many more.

When the reflex action is a mere twitch like the

knee-jerk we speak of a simple reflex, and the conception of this simple reflex is the main idea by which physiologists explain the mechanism of the central nervous system. But as soon as we pursue the subject further the simple becomes very complex.

By a *co-ordinated reflex* we mean a connected set of reflex contractions, which produce a purposeful movement such as the defensive movement of the frog's leg. Really this complex act should no longer be called reflex; for it presupposes a set of complicated neurokym-combinations in the spinal cord, and different groups of neurones must be involved in it. Nevertheless the co-ordinated reflex still follows the appropriate stimulus inevitably and thus still possesses the character of the mechanical twitch.

4. *Inherited Automatism.*[1] A higher step is formed by what we call *inherited automatisms* or *instinct.* Here it is no longer a mere question of useful reflex movements, but of a chain of co-ordinated reflexes following each other in time, each one releasing the next, and all together constituting a complex performance fitted to a given end. If we cut off the head, and with it the brain, of a male field-

[1] I have been blamed by certain persons for using the term automatism for instinct and not merely for habit. But I do this deliberately. "Automism" is derived from αὐτόματος (spontaneous). An automaton is a machine which imitates the movements of a living being, or a living being whose movements are always carried on in the same way, like those of a machine when you press the button. Similarly the word automatism refers not to the cause of the movement but to the way it takes place, and is excellently fitted to show how the same performance can take place instinctively as a result of inheritance or habitually as a result of individual requirements. (See *infra*: Mnema.)

cricket and put a female under it, it carries out the act of procreation, a series of purposive movements, to the end, in a completely purposeful manner. If we remove the whole of a pigeon's cerebrum and throw the bird in the air it flies with a perfectly regular movement to the nearest object, and settles down there no less easily. The same pigeon also swallows the grain that you put in its beak perfectly well, and yet it would starve to death if left alone beside a heap of grain, because it is not able to associate the impression that the grain makes upon its eyes or its sense of smell with the feeling of hunger. In the same way, if male and female brainless pigeons are shut up together they give unmistakable signs of sexual desire but do not gratify it, simply because the association between what they see and smell, on the one hand, and the motor impulses necessary for the satisfaction of their desire, on the other, is lacking. Thus in both cases there are present two chains of automatisms, which are not connected with each other, apparently because the organ which usually unites them is lacking.

It must be admitted that it is a good way from a reflex to an automatism; three main steps must be distinguished: (1) *the simple twitch,* (2) *the simple purposive reflex act,* (3) *a longer chain of purposive performances.* Yet physiologists do not hesitate to derive the more complex from the simple and to assume that automatisms are combinations of reflexes. The common element in all these phenomena is the

regular, compulsory release of movements by sense-stimulations through the mediation of the complicated organs of the central nervous system; a process which can nevertheless be independent of the cerebrum. I say *can* be, because there are also cerebral reflexes and cerebral automatisms.

Here arises a question which we already outlined when speaking of the painlessness of injuries to the cerebrum: What is the real difference between the functions of the cerebrum and those of the spinal cord and the lower brain centres? I think that this is settled by comparative physiology, and that Isidor Steiner has hit the nail on the head through an experiment. Later, when we review the physiology, we shall understand the matter completely. With men and other mammals and with birds, the cerebrum, as we have already seen, outweighs by far all the other centres. There are kinds of fishes, on the other hand, in which the *mid-brain* (the optic lobes) is far larger than the cerebrum. If the cerebrum is removed from these fish they do not lose the power of directing their automatisms; they make their appearance when food is left for them, hunt for it, and, judged by the measure of a fish's intelligence, behave themselves normally, if we make allowance for the injured organs of smell. With all other vertebrates, on the contrary, and even with those invertebrates, such as ants, in which the cerebrum has the preponderance, the animal from which this is removed loses its mental guidance. It is consequently not any special

structure of the cerebrum, but the superior influence of the largest and most complex superior centres, that determines an animal's mental control, as Steiner has logically proved. This simple fact alone is sufficient to show the nonsense of the current assertion that the cerebrum is in itself the only "organ of consciousness." (See above, Chapter III.) It is only for the reason just explained that human superconsciousness has become nothing more or less than the inner reflection of the principal activity of the human cerebrum.

When a stimulus which arrives in the brain gives rise to no movement but is transformed into tension, we speak of an *arrest,* or *inhibition.* The ganglion-cells and the substance between them are regarded partly as inhibitory organs. If, on the other hand, a strong movement is called forth by an inner, intracerebral, stimulus which is weak in itself, we speak with Exner of smoothing the way (Bahnung).

5. *Results of Cerebral Excisions.* The physiologist Flourens was the first to completely remove the cerebrum from pigeons and yet preserve the animals alive. Afterwards Goltz succeeded in removing the cerebrum of several dogs, with the exception of unimportant parts of the smell centre, and preserved at least one dog in good health for eighteen months. At first this dog had to be fed artifically, but gradually regained the power to snatch pieces of meat, to chew and swallow, and also to lap milk. His food had to be put in his muzzle, for he no longer smelled.

But he detected a solution of quinine, though he consumed ordinary dog food with avidity. If his feeding was long postponed he became uneasy; if, on the contrary, he had eaten more than enough he ceased to swallow (feeling of repletion). He slept like a normal dog, only for a shorter time, but did not dream (as normal dogs do), though he could be wakened by sound or pinching. When he was pinched he barked and tried to bite, but generally snapped at the wrong place. Although at least a part of the optic nerve was preserved, visual stimuli made no impression at all upon him. Yet he could walk properly. He remembered nothing, but growled and barked every time they tried to feed him. He was thus a child of the moment and mentally even more helpless than the brainless pigeon. But he still had complicated automatisms and, for example, would brush a drop of acid off the skin of his back with his hind leg. Only through the extraordinarily clever care of a gifted attendant could he be kept alive. An ant or a cricket whose brain (the stalked bodies) has been removed acts in much the same way as Goltz's dog.

Children without a cerebrum have also been known to live a short time, to cry and move themselves, and even to react to stimulations of the skin.

We learn from these facts:

(*a*) Quite complicated and purposive instincts and automatisms can exist without a cerebrum; the subordinate centres, with the spinal cord, can turn

sense-impressions to account and transform them into orderly, purposive movements, and can thus instinctively feel or hear, and act.

(*b*) When the cerebrum is removed from animals in which it is preponderant, these automatisms lose their connection with each other, or *their purposive co-operation for the carrying on of life,* so that the animal is like an imbecile and neglects to pursue the necessities and aims of life, to eat, to drink, to beget. (Flourens's pigeon, Goltz's dog, Yersin's crickets, my ants, the brainless new-born child.)

(*c*) When the cerebrum is smaller than another brain centre, the latter takes over the direction of the automatisms and makes the spontaneous guidance of life possible for the animal without a cerebrum. (Steiner's brainless fish.)

The nerve-physiologist can make no greater mistake in his thinking than to confuse the notion of consciousness (the introspective subject-matter of psychology) with that of physiological functions. *There can be no organ of conciousness,* simply because " consciousness " is not an organic conception and has nothing to do with the physiological conception of energy, whose inner, introspective side it presents. It was therefore an objectless warfare of words when the physiologists Munk and Goltz were in conflict over the question whether the latter's brainless dog possessed a consciousness or not. And we must hold with the theory of Volkmann and Pflüger that the spinal cord and the subordinate brain centres

of that dog possessed their subordinate minds and their subconsciousness; a theory which is indirectly confirmed by the animal's expressions of displeasure and pain. Goltz says, to be sure, that his dog expressed anger, but never joy; and yet his greedy feeding can be regarded as an expression of pleasure.

On the whole, the automatisms, whose higher purposive combinations are known as *instinct* and constitute the main feature in the nervous life of most of the lower animals, must be regarded as a lower form of the same mental life which has its chief seat with men in the lower brain centres, but which has lost its independence as a result of the greater and greater encroachments of the cerebrum. Perfectly independent with the lower fishes, less so with frogs, still less with birds, very awkward with dogs, with men these automatisms have become only the subordinate servants of the cerebrum. Yet there is no fundamental contradiction between instinct and reason, and the insects with the most instincts show the greatest mental plasticity.

The impulses and passions of human beings and the lower feelings connected with them are remnants of the instincts, and rest on automatisms performed, in the main, by the lower centres, though more or less strongly controlled by the cerebrum.

6. *The Plastic Work of the Cerebrum.* In relative contrast to reflex and automatic acts, we observe in men and brutes a kind of nervous activity which does not follow a stimulus necessarily or mechanic-

ally, but adapts itself to each animal individually according to the conditions which affect it, and also produces *voluntary* movements—or reasonable conduct; which appears to arise spontaneously from the brain in consequence of the actions and reactions of the energy—of the memories and so forth—stored up there. The utilisation of experience, *i. e.*, of former influences of the senses upon the brain, plays a great part here and takes place in accordance with the laws of memory, which we learned in Chapter I. An automatism is regardless of experience, and reacts the hundredth time to the same stimulus in exactly the same way as it did the first time; but the plastic nervous activity reacts differently and constantly corrects errors which it has made. A scalded cat fears hot water and a whipped dog fears the whip. This plastic manner of reaction in the nervous system—its pliability and capacity for combination and adaptation—corresponds to a whole progressive series of higher faculties which we learned to know in psychology as judgment, reason, and imagination. In more recent times they have been also called *powers of modification.* It is a great mistake to suppose that this plastic faculty of combination and adaptation belongs to man alone. It is already fairly strongly developed in the higher mammals. As early as 1810, P. Huber demonstrated the memory of ants, and thirty years ago I proved beyond a doubt that ants make use of experience in plastic adaptation. In more recent times this demonstration has been carried further by von

Buttel-Reepen with bees, the Jesuit Father Wasmann and myself with ants [1] (by me also with a water-beetle and with bees), and by Lubbock with a wasp. Some power of modification or plasticity is indispensable for every independent, living, moving creature. Thus if the subordinate nervous centres, which are now dependent in the case of men and the higher brutes, have lost their plasticity and now direct only a purely reflex and automatic activity, we must suppose that this happens simply as a result of their subordination to a main governing nerve centre, the cerebrum.

These are biological facts. Physiology cannot yet understand the mechanism of the reflex, because it does not know the chemistry of life, and can still less comprehend that of the plastic nerve-function. It must content itself with observation and inferences from analogy.

7. *Secondary Automatisms.* We have already seen in the chapter on psychology that the repetition and fixation of memory-images brings about what we call habit. But habit again gradually becomes automatic, if indeed not quite so strongly so as inherited instincts. Habits are called *secondary automatisms.* Even with ants and bees we can establish the presence of habits. The *plastic brain action thus becomes automatic by repetition.* With men habit is an

[1] It is impossible to give a review here of the highly instructive results attained in comparative psychology. I therefore refer the reader to my treatise on "*The Mental Powers of Ants.*" Ernst Reinhart, publisher, Munich, 1901. ["*Ants and Some Other Insects,*" Kegan Paul, pub., 1894.]

automatism of the cerebrum. This tendency of all plastic nerve action to become automatic through repetition shows plainly enough that the plastic tendency of vital energies is not secondary, but *primary*.

We shall not pursue this highly important question any further here; it would lead us too far afield. But it follows from what has been said that the physiology of the cerebrum is not really different from that of the other nerve centres; it is only more complex and superior in command, exactly as the cerebral mind is only more complex than the minds of the subordinate nerve centres.

8. *Localisation.* I shall not repeat here what has been said in Chapter II. The celebrated brain-anatomist Gall was the first who localised speech anything like correctly. Yet he believed that every possible mental faculty could be localised in the brain, even through the skull; and though he discovered many truths intuitively and ingeniously, he mingled so many phantasms with it all that he discredited an idea which was correct enough in itself. It is peculiar at any rate that the dogs from whose cerebra Goltz cut out the frontal lobes became ill-natured, while those from which he removed the occipital lobes showed themselves very gentle—which corresponds fairly well with Gall's idea. From the localisation given in Chapter II. of speech, memory-images of sensation, and the motor fields of the cerebral cortex, it undoubtedly follows that the different divisions of the cerebrum show a relative specialisation of their functions. But they are all so intimately connected

together by the association neurones that it is scarcely possible to put a more detailed localisation of the mental faculties to the test. In any event we make a partial use of our right cerebral hemispheres and a partial use of our left for different purposes. But pathology teaches that after the loss of a part of the brain other neighbouring parts can be trained to take its place, if the injury has not been too great. In short, our cerebrum is our mental organ and it is clear that certain neurones of its different divisions are at work when we work mentally, but in such a complicated manner that we are still a very long way from gaining even a crude idea of the mechanism of this work.

But this much is sure, that the cultivation of speech as the coin of thought (see Chapter I.) has given a tremendously broadened field to the plastic activity of the cerebrum and has alone made human culture possible, especially through the storing up of the mental work of our forbears by means of written speech.

9. *The Senses.* The physiology of the sense-organs is very complex. It is founded on Johann Müller's doctrine of the *specific energy* of the senses, as follows:

(*a*) Different kinds of stimuli, or processes in the external world, always produce the same general kind of effect in the same senses. For example, pressure and light-waves which affect the eye call forth sensations of colour; and catarrh of the tym-

panic cavity and real ringing of bells both cause a "ringing" in the ears.

(*b*) One and the same stimulus acting on different sensory nerves causes different sensations. When I press the retina there are sensations of colour, when I press the inner ear there are sounds, when I press the skin there is a feeling of touch, and the same rays of sunshine which produce sensations of light in the retina produce feelings of warmth on the skin. But when we compare the sense-organs and sense-impressions of different animals we come to the conclusion that the specific energy of the senses did not exist in the beginning, but has been built up very gradually through the accommodation of the structure of an animal's sense-organs to definite kinds of stimuli in the outer world, that of the eye to light, of the ear to sound, of the nose to the chemical qualities of bodies soluble in the air. At first there was an undifferentiated skin-sense in lower animals, which has gradually become differentiated into various specific organs. The eye of lower animals, for example, is still very primitive; it has been shown that such animals feel the light with their skin, but in individual spots certain nerve endings are gradually developed which adapt themselves especially for the reception of light-waves.

The specific energy of the senses is thus variable, and only with the higher, completely differentiated senses is it sharply specific. Specific energy is a sensational quality, and thus psychological rather

than physiological. Light, colour, warmth, pain, are psychological conceptions. This is why a colour-blind person, for example, can form absolutely no idea of how a normal person distinguishes green from red. And thus it is clear that those parts of the cerebrum which receive the stimuli of different sensory nerves give them a different qualitative value, according to the specific energy of each particular sense. In other words, specific energy is a cerebral phenomenon. This conclusion could really be proved by such a fact as this. Both the eyes of a blind man who happened to be under my care, and consequently both the optic nerves, had been destroyed for twenty-five years; yet he still had hallucinations of sight and believed that he saw persons in front of him in life-like figure and colour.

But all this is far from proving that the original cause of specific energy lies in the cerebrum. It is much more probable from the history of the development of the senses in the animal kingdom that it was gradually developed as a result of the formation of the peripheral sense-organs.

This is so true that the difference between the structure of certain senses in the lower animals and our own enables us to conclude that their specific energy must be to some extent different from ours. To illustrate: Whether a sense can give an accurate or only an inaccurate knowledge of space or time depends upon its arrangement and position. We human beings recognise space directly by means of

touch and sight, and time by means of various sense-impressions, especially by means of hearing—I am not talking about indirect conclusions drawn by the aid of clocks and other apparatus. The sense of smell, on the contrary, can give no knowledge of space, because of its hidden position and its immobility. But I have shown that with certain insects the organ of smell situated at the end of moving feelers gives a knowledge of space; so that the insect has what we might call contact-smells and a topochemical smell-sense. Yet we cannot conceive of such a topochemical smell without a modification of the specific energy, *i.e.*, of the subjective quality, of the sensations as felt by us. Because the images of differently coloured objects are given in miniature in their exact form, photographed on the retina of the eye, and because the movements of the two eyes enable our retinas to come in constant contact with the light-effects of the outer world, this sense gives us a remarkably exact knowledge of the most distant external space. Because our skin can feel the different parts of surrounding objects in a very reliable way, the sense of touch gives an exact knowledge of the space nearest to us. [Both these examples show that the inner experience depends largely upon the construction of the organ.]

Since it is impossible to go into the complicated details of the physiology of the senses here, I shall speak briefly of those senses only which are possessed by man. These senses are also found, at least in

part, in most of the lower animals. Yet many animals are without the sense of hearing, many without the eye; and, as we have already explained, variations of specific energy are at least very probable. That any other developed special sense is present with any animal is not established, but not impossible. Nevertheless up to the present all attempts to demonstrate it experimentally have had negative results, especially the attempt to discover a special sense of direction; though, to be sure, the electric fishes, which give electric shocks by means of a special nerve organ, may have a specific sensation for it.

The Sense of Sight. The optic nerve lies at the base of the brain, and there in the case of man the fibres from the two eyes meet and half of those from each eye cross over to the other side of the brain. The end of the optic nerve is spread out at the back of the eye in the retina, and here we find the ganglion cells of its neurones. The images of the outer world formed in the eye by means of the crystalline lens, the vitreous body, and the other parts of the organ, are thrown on the retina, whose neurones conduct them through the optic nerve to the external *corpus geniculatum,* a subordinate brain centre. At the point where the two optic nerves cross, their fibres divide into two branches, one of which runs to the cerebral hemisphere of the same side, the other to that of the other side. The ganglion cells of the external corpus geniculatum transmit the retinal image again through their nerve processes to the cerebral cortex of the

inner (median) side of the occipital lobe (O, Fig. 10), which thus forms the centre for what is called mental vision, *i.e.*, for cerebral vision. But by means of reflex mechanisms in the *corpora quadrigemina,* these neurones are also connected with the muscles which move the eye and the pupils.

The sense of sight tells us of the colours, forms, and movements of objects. Sight with the two eyes together also enables us to distinguish "depth," or distance in the third dimension. In the case of no other sense can we show so beautifully (see Chapter I.) how sensations must first be trained and elaborated in the brain in order to become perceptions. Nowhere else can we show so well that what the mind gets from nerve stimuli is no longer what our nerves originally transmitted, but the gradual product of an important and oft-repeated brain activity.

The Sense of Hearing. This sense with men is seated in the *cochlea* of the inner ear, through which the auditory nerve is distributed. The sound-waves are communicated to the organ of hearing in the cochlea by the vibrations of the tympanic cavity, the auditory bones, and the fenestra. The auditory nerve runs to the medulla oblongata, where it forms a ganglion and comes into connection with the cortex of the temporal lobe of the cerebrum, evidently by means of the neurones of the inner *corpus geniculatum;* but these relations are very involved and still confused (see Figs. 7 and 9).

The Sense of Equilibrium. Along with the audi-

tory nerve runs the vestibular nerve, which accompanies it to the labyrinth of the ear, but ends there in the semicircular canals. It has now been fairly well established by Mach and others that this nerve serves for subconscious sensations produced by the bodily equilibrium, by changes in its rate of movement, and by its bendings. At the other end the nerve makes directly for the base of the cerebellum, where lie the ganglion cells from which at least a part of its fibres spring. Other of its neurones form a ganglion in the petrosal bone.

The Sense of Smell. The fine chemical molecules which emanate from smellable objects are mixed with the air and stimulate the endings of the olfactory nerve to produce the hundreds of different sensations that we call smells. These nerve endings lie deeply buried in the upper part of the mucous membrane of the nose, in very close connection with the olfactory bulbs of the cerebrum, whose neurones are thus almost directly connected with the mucous membrane by means of short fibres. The olfactory bulbs (Fig. 7) are connected by means of a path of fibres (the *tractus olfactorius,* Fig. 7) with the point of the temporal lobe of the cerebrum (the *cornu ammonis* and its accessories); and this is the olfactory centre (Figs. 9, 10).

The olfactory is the only sensory nerve in direct connection with the cerebrum. This can be explained in this way: The cerebrum, which scarcely exists at all in lower vertebrates, is developed in the

first place as an outgrowth of the olfactory nerve, and then increases in size and importance until at last with higher animals it has become the main centre of the nervous system.

The Sense of Taste. The sense of taste, whose end-organs lie in the mouth and on the tongue, informs us of some of the chemical qualities (sweet, sour, salt, bitter, metallic) of certain substances which dissolve in the saliva. Beyond this, what we still call the taste of our food [all the delicate flavours] consists of odours which go up from the back of the mouth to the nose.[1]

The nerve of taste is distributed like a common nerve of touch, has a ganglion, and ends in the medulla oblongata. Its cerebral centre is not yet exactly known.

The Skin Senses. These were formerly confused with each other because they are distributed everywhere in the skin. But in more recent times, von Frey in particular has succeeded in clearly proving that the sensitive places for pressure, warmth, cold, and pain are situated in different, though closely contiguous, spots in the skin. Thus we must distinguish from each other the senses of touch or pressure, warmth, cold, and pain. There are even certain parts of the body in which one or other of these is lacking;

[1] [The reader can prove this for himself easily enough by holding his nose and trying to distinguish between raw apple and raw potato, or between different kinds of meats, soups, fruits, or candies by taste alone. In trying the experiment one should take care not to draw the breath up into the nose from the back of the mouth.—TR.]

the cornea of the eye, for example, feels nothing but pain. The nerve endings of the skin are of various sorts; the "corpuscles of Vater," the touch "corpuscles of Meissner" (Fig. 6), the "end bulbs of Krause," and free endings between the cells of the epidermis. The free endings serve apparently for sensations of pain, the corpuscles of Meissner for the sense of touch, and the end bulbs of Krause, according to Frey, for heat and cold. But that is not all quite certain yet. The cerebral cortical centre for the skin senses is almost identical with the motor centres (see Fig. 9).

Sense Not Clearly Differentiated. We have seen that our senses are apparently developed from senses which are not clearly differentiated in some of the lower animals. But we ourselves still possess a whole set of dull, only indefinitely localised feelings which we designated in Chapter I. as visceral feelings and of which we said that they mark the transition from the sphere of knowing to the sphere of emotion. These feelings are caused through certain internal nerve endings the stimulation of which produces in our consciousness more or less distinct varieties of sensation, though we cannot distinguish them exactly from each other as senses. Examples of these are found in the feelings of hunger, thirst, fear, sexual desire, the desire to urinate and defecate, tickling and itching.

Muscular Sense. There has been much conflict over the muscular sense or the sense of movement,

which has also been called the space sense. It is certain that we feel our bodily movements, and through feeling recognise what limb is moving and how it is moving; we feel the active and passive movement of the muscles, the position of the limb that is moved, the amount of muscular exertion, the resulting fatigue, the weight and the resistance of objects. Are there special nerve endings in the muscles through which these sensations are produced? According to certain experiments it seems that there are.

We thus see that the time-honoured "five senses" no longer pass current. The matter is more complex. Moreover in Chapter I. we saw how sensory stimuli are mentally elaborated in the brain, and we shall not return to the subject here. But these slight hints are enough to show that the physiology of the cerebro-spinal nervous system is a veritable world, though we are still very ignorant about it, and indeed it has just begun to reveal itself to us. I will only add that outside of the cerebro-spinal system there are many scattering neurones in the body which discharge small special local functions in relative independence, like so many lower animals—automatically regulate the beating of the heart, for example, or expand and contract the blood-vessels, or even bring about the secretion of certain glands. The cerebrum can not modify their activities everywhere with the same certainty and definiteness; for this depends upon its connection with these scattered neurones through collateral nerve branches. It depends also upon the force with

which the neurokym of the cerebrum is thrown into these peripheral mechanisms; and this explains occasional almost incredible effects of suggestion in certain somnambulists, such as bleeding stigmata, blisters, the absence of bleeding from cuts, and many others. Formerly such occurrences were interpreted as frauds or miracles, according to one's individual point of view; they are neither one nor the other, but rest on the cerebrum's peculiar faculty of occasionally sending strong stimuli to a special part of the periphery and of checking others which would naturally go there.

CHAPTER V

EMBRYOLOGY AND RACE HISTORY OF THE NERVOUS SYSTEM

(1) *Embryological History or Ontogeny. Inheritance.*

ONTOGENY means the *origin of the individual.* Human beings originate, like most other living things, from the union of two microscopic germ cells, a male spermatozoon and a female ovum. The nuclei of the cells play a very special part in this, while the protoplasm of the ovum usually serves only as nourishment for the nuclear substance. Reproduction and union are thus the same thing; the life of the parents is carried forward in common by two living germs, not a new life produced.

The embryonic cell derived from the two united germ cells draws nourishment from the yolk and divides and subdivides, thus producing very many embryonic cells or blastomeres, which are distributed in different layers and gradually form the embryo. In this process of division or *mitosis,* the hereditary substance or chromatin is always distributed in such a way that approximately or perhaps exactly one half of the substance derived from the father and one half of

that from the mother go to each cell. In its growth the embryo goes through all possible transformations of form in at least partial imitation of the forms of ancestors of the species; for example, the caterpillar form of the butterfly, which corresponds to the butterfly's ancestor, the worm; the teeth of the embryo of the whale which disappear afterwards but correspond to the teeth of the whale's ancestors, for the adult whale itself has no teeth; the gill arches of the human embryo, which point back to our fish-like aquatic ancestors; and so on indefinitely. The nature of the mysterious energies by which the forms of the embryo of every kind of animal or plant are determined cannot be discussed here, nor the hypotheses about them. Yet we must state this:

(*a*) The normal development of an embryo depends upon the healthiness of the two germ cells from which it originates, its freedom from disturbances in its further development, and good, appropriate nourishment.

(*b*) The embryo represents a mixture of the peculiarities of the paternal and the maternal germ cells, and in its development now the one and now the other takes the lead.

(*c*) In the fertilisation of an ovum by a spermatozoon there is a tremendous play of chance; for the reproductive glands of the father contain millions of spermatozoa and those of the mother at least very many ova, while only one spermatozoon has the good fortune to fructify a given ovum. But it is to be

definitely understood that the substance of each spermatozoon contains a definite mixture of the energies of its ancestors which is different from that in any of the rest. The same is true of the ovum. So we see that the hereditary peculiarities of the being which springs from them both are determined by a combination of the mixture of energies in some particular fructifying spermatozoon with that in some particular ovum. Moreover, either of the two germs may predominate over the other in the combination.

Nutritive relations in the body of the mother are undoubtedly important for the normal health and development of the embryo; but they do not determine its individual characteristics in the slightest, because, in spite of the very important influence of the mother, it receives, on the average, as many characteristics from the tiny paternal cell as from the ovum.

In each embryo a small supply of reproductive cells is reserved in a definite fund (Anlage) as sex or germ cells. These cells are at first neither masculine nor feminine and their arrangement is at least apparently neutral. But at a definite period in the life of the embryo it becomes settled whether this germ-fund is to be masculine or feminine. In the former case, the cells develop into spermatozoa and make a place for themselves in the masculine reproductive glands. In the second case, they develop into ova and build their place in the ovaries. Thus male and female glands of sex arise from the same germ outfit (Anlage). But when the differentiation has once

taken place the whole subsequent development of the individual in all parts of the body gradually takes on male or female characteristics, and in certain animals where the two sexes are very different (such as peacocks, deer, and ants), this involves striking differences in the whole bodily form.

The nervous system is developed from the outer germ-layer, *i. e.*, from the same layer of the embryo as the skin and the senses. In the median line of the back, a part of the ectoderm folds in to form a groove, which then becomes detached from the outer surface, and develops into the brain and spinal cord. Then the cells of this central nerve organ multiply tremendously and form the outlines of the separate parts of the grey substance. Then later the fibres grow, apparently from the cells, and much later, partly indeed after the birth of the child, these fibres surround themselves with the white medullary sheath. The relations of the nervous elements of the embryo to those of the adult have been already discussed in Chapter II. According to what was stated there, the peripheral nerve fibres grow out directly from the cells with which they are connected.

At the time of birth the brain is already quite large; with the human embryo indeed it is large beyond all proportion. This shows how early the foundation for our organ of thought, feeling, will, and movement is prepared; and yet in the new-born child a large number of the cerebral neurones are still grey, without medullary sheath, and unable to function. These

sheaths are developed only gradually during the child's first year, and with their appearance the neurones first begin to work. From this it follows that much of what we suppose an infant to have "learned" was not learned at all; but inherited instincts of all sorts began to manifest themselves when the organ on which they depend got ready to act. First the reflex centres of the spinal cord and the ganglia at the base of the brain came into function, and this produced automatisms, such as sucking. Then the impressions of the external world began to exert a moulding effect on feeling, hearing, sight, taste, and smell. In other words, these impressions gradually reached the cerebral centres as one after the other of the latter became capable of functioning; and the empty page of the cerebrum began to be inscribed with concrete memory pictures.

The observation of the gradual development of the mental activities of the young child, first undertaken by Kussmaul and Preyer, is highly instructive; and the reader is referred to the original works, for there is no space here to recount their investigations. At first the child cannot fit its movements to its sense-perceptions at all. It has also apparently no real perceptions, but only a confused mixture of sensations. Sensations of touch become associated with each other at first mainly through movements. Then come hearing, sight, and the other senses. The child learns to grasp what he sees and to recognise what he has seen before. Memory-images remain and

become associated with each other, even with those of different senses. Yet they are still preserved very badly; for as a rule a child of four or five no longer knows anything about the experiences of its first year. Perhaps we should not say that they are badly preserved, for, to be sure, they remain and are used [in a practical way]; but later mental experiences no longer become associated [in any conscious way] with those of the first year.

Different children are very different, and even in the early years their hereditary disposition, their strong points, and their weaknesses, can be recognised. We cannot go into the hygiene and pedagogics of childhood here; it is enough to point out that the development of children is exceedingly irregular and that the transition from embryo to adult goes on imperceptibly from birth to the eighteenth or twentieth year with girls and to the twenty-third or twenty-fifth with boys. This development of the body involves a corresponding development of the mind and of nervous functions in general; and our interest here is to trace this in broad outline.

Up to the time of birth the embryo lies hidden in darkness, nourished and growing, but protected from the outer world and all its influences; and although it moves a little its rôle is purely passive. But now it is suddenly torn out of this repose and comes into contact with the world. For all the rest of its life this world affects it unceasingly through its senses and sensory nerves, while it in turn acts on the world

through its motor mechanisms. The organ which registers, arranges, and combines almost all the impressions and also looks after the reactions is the brain. From previous chapters, and especially from what has been said about memory in Chapter I., it is clear that the work of the brain with all its elaborating of outer impressions, representations of movement, and voluntary impulses, involves continual, life-long reconstructions of one's personality—*i.e.*, of the brain itself. The brain is the man, say we. The immense receptivity of every brain to what goes on in the outer world makes each very different from every other according to the circumstances in which it is placed, the work it performs, and the people and things that influence it. It is here that the laws of exercise and habit come in.

We can say in the main that the brain is strengthened by regular exercise in the same way as a muscle. Practice makes perfect. Therefore the more things you practice and the more varied they are the more capable is your brain in different directions. Yet this law should not be misunderstood. Activity is exhausting unless there is time for nutriment and repose to refresh the exhausted nervous tissue, and the products of katabolic processes are removed. Sleep is the brain's repose, and during sleep the exhausted neurones are built up again. For the rest, its substance is built up, like that of all the other organs, by digestion and the circulation of the blood.

Experience teaches that the brain, like the muscles,

is subject to the law of training, according to which occasional excessive efforts with long intervals of repose are rather injurious, while a many-sided activity consistently repeated, interrupted by sufficient shorter rests and supported by a sufficient nutrition is strengthening. To understand this law we must consider a few points which pedagogy has disgracefully neglected. A healthy training of the brain must be as many-sided as possible. Above all, the motor side, the appropriate exercise of the muscles—not mere muscular exercises, but muscular effort directed to reasonable voluntary ends—should go hand in hand with the training of the senses and the memory. Please observe that it makes a difference whether one lifts a weight mechanically a hundred times one after the other, which exercises nothing but the muscles and the lower brain centres, or whether he performs a useful work, which requires skill and co-ordination, and therefore considerable harmonious activity of the whole brain. Machine work which only demands a very narrow and one-sided activity of mind or body is not favourable. Thus harmony of brain work is a condition of sound training and the best way to further a strong and healthy development of the brain.

But we must avoid laziness and neglect no less than one-sided overexertion; and we must beware of all injuries to the fine and delicate brain substance. The worst of these is narcotic poisoning; of which we shall speak again when we come to Hygiene.

If we consider the ontogeny of the child's brain in the light of the law of exercise or training, we find at first a natural tendency to receive and elaborate concrete sense-perceptions and to act so as to produce them. *The child thinks concretely* and thirsts for concrete knowledge. How could it understand abstractions, when adults only get them after elaborating their ideas for years? The child's neurones are absolutely devoid of the old associated memory-images which such abstractions would involve. The result is that as soon as the child has learned to speak and read and write, and thus possesses the instruments of speech—the materials for the currency of thought—he immediately begins to play with the instruments themselves—with the concrete word-images. The sense or thought which the word stands for has a meaning for him only when it is a matter of the simple, familiar things about him, which he can perceive by his senses, and which involve little or no abstraction. Other words he learns like a parrot, as mere sounds or written letters. The pedagogue, who is too often a pedant as well and compels the child to learn by heart all sorts of phrases the meaning of which he is quite unable to understand is playing a horrible, criminal game with the child's brain. The saying that memory must be exercised mechanically is unpsychological and thoroughly false. It cultivates one of the worst peculiarities of men, the replacing of thought by words, meaningless gabble. This pathological product of our culture is to be

found, alas, in every head, and is one of the evil effects of the school which cannot be sufficiently denounced and combated, but which is widely propagated in press and books.

Well then, the child thirsts for concrete knowledge and this thirst must be satisfied. We must carefully combat all premature abstractions. Abstraction comes altogether of itself, and gets built up in the brain in a proper way by the comparison of concrete images, without our having to hasten its development. To be sure, children are very different. Some show an early inclination to abstract thought, *e. g.*, to mathematics, while others are inclined to think much more concretely and inductively. But what of it? Both must understand before they learn, after they know the elements of speech. What we have understood sticks in the memory much more firmly and more usefully than phrases that we learn like a parrot, and that too without special mnemonic aids. We should try above all to avoid the use of words which are not yet understood. Unfortunately the teacher himself does not understand the meaning of the words that he uses and teaches.

A teacher once said it was a good thing that school children were so inattentive; for otherwise they would be ruined by overexertion. In these winged words lies a judgment upon our whole school system; for why should we teach what is not attended to? They are moreover a confession of our own incapacity; and they are not all true. What ruins the children more

than anything else is not strained attention but fear of punishment, examinations, and scoldings. This nightmare oppresses them continually, and spoils their lives and the pleasure of learning. When people understand, as they do in the country training homes,[1] how to remove this nightmare and to preserve a proper harmony in mental work, they need not worry about attention; for the child does not get tired so soon, and so long as it has plenty of time for sleep it remains good-natured and lively.

It is hardly necessary to add that all the higher and better qualities of mankind should be trained ontogenetically; especially sympathy, the sense of social obligation, work for others, self-reliance, the avoidance of all useless vanities, and the formation and consistent carrying out of useful resolutions.

In this way, through proper exercise, the brain accommodates itself to its human social environment. And thus we can designate this whole group of factors which act upon the growing brain as *adaptation,* or *education.* When we speak of education we must not forget that what the educator has to say has least of all to do with it. The most effective influences are surroundings, examples, imitation, and the activity of the child himself. And we must add that one's education or adaptation is by no means finished when he has stopped growing. The law of practice holds to old age, to the very grave. One's whole life is a continual struggle for adaptation. But here a

[1] See Chapter XI., 2, *The School of the Future.*

peculiar phenomenon appears. Many-sided life-work carried through consistently not only strengthens the brain but also strengthens its continued power of adaptation. The more the brain works the more capable it is of receiving new impressions and elaborating old ones. Age in itself tends to stiffen the brain and make it automatic. An old man keeps repeating his old-accustomed abstractions and modes of thought and speech. But the lazy man who works as little as possible usually gets old mentally faster than the man who works. The latter remains more elastic and capable of adaptation.

All that has just been said refers to only one of the factors in ontogenetic development. A second factor no less important is already contained in the two united germ calls. This is the factor of inheritance; and it is of immense influence. For to get a musician from germs with no music in them or a man of genius from united germs with a bent to stupidity is as hard as to get a duck from a hen's egg. Exercise can develop the germ energy already present normally to its furthest limit and turn it to the most appropriate use; but it has no magic to produce what was not in the germ.

Germ energies contain very different admixtures of the characteristics of one's progenitors. *Atavism* is the appearance in any individual of a characteristic which his parents did not possess, but one of his ancestors, perhaps his grandmother, did. Apparently in a case of this sort the child was derived from one of

the parental germ cells in which the peculiarities of this particular grandparent are especially well-preserved. The calculation of these puzzling hereditary tendencies is beyond us; but their effects are only too plainly visible. Everything gets inherited: imagination, conscience, artistic sense, malice, scheming, strong or weak passions, as much as red or black hair or a crooked nose. But it is clear that for man the hereditary disposition of the brain is the most important. The lesson is that in the generation of successors there should be a careful selection, the sound and capable should multiply, but not the sick and incapable or abnormal; for all efforts of education or adaptation go to pieces when the proper tendencies are lacking in the germ. What we have just mentioned can be called *inheritance* in the true sense of the term.[1] As we shall soon see, those effects of the outer world which only influence already differentiated bodily cells to an infinitesimal extent and do not influence the germ cells at all, are transmitted through mnemetic engraphy and thereby prepare in a latent way for the evolution of the species. Only when the engraphy strikes the germ cell itself can it cause more rapid transformations. That should be comprehensible, but it has a way of being especially misunderstood. You could cut off the tails of a given kind of animal for two thousand years and yet the descendants at the end of that time would be born with the same old tails. The rapid and immense variations

[1] See *infra* Race History.

within a species depend upon the endless mixtures of germ energies in the conjunctions of germs, of which we have already spoken. This is proved by gardeners and animal-breeders, who gradually produce new varieties and breeds of plants and animals by a proper and continuous selection for reproduction of those which possess peculiar qualities which they wish to strengthen.

But between this pure inheritance and the adaptation previously mentioned there is an intermediate kind of factor influencing the development of the individual, which can be called disease of the germ or *blastophthoria,* and which lies midway between inheritance and adaptation. Everything which injures either the germ in the body of the parents or the embryo in the womb disturbs the ontogeny and can produce mentally or physically crippled descendants in spite of good sound ancestors. For example:

A healthy pair of East Indians with two healthy children come into a European town and learn to drink alcohol; both become alcoholics and poison their reproductive glands with the drug. Then they engender four more children of which one is an idiot, the second has rickets, the third is epileptic, and the fourth still-born. This is called an alcoholic heredity —an artificial poisoning of the germs of our descendants before their union, which, alas! is rife in our whole European society.

Healthy parents have a healthy child; the father infects himself with syphilis; the spermatozoon that

begets the second child is syphilitic; the second child comes into the world syphilitic, and comes to grief miserably.

Two healthy parents have healthy germ cells, which unite and develop at first as a healthy embryo. But during her pregnancy the mother contracts typhoid fever, and the child is weakly or weak-minded. Or at its birth the child's skull is injured, the brain is bruised, and some of the neurones destroyed; so the child grows up with mental defects and has convulsions or paralysis.

Healthy parents beget a healthy embryo and it is born as a healthy child. But in its second year the child gets a sickness, say cerebral meningitis, or falls out of the window and has a cerebral hemorrhage. In either case the brain suffers and cannot develop normally, and the child becomes weak-minded or morally defective, with all kinds of bad qualities which stick to him to the end of his days.

Indeed I have seen a case where an excellent young man of twenty became an incorrigible good-for-nothing and prodigal and indulged in so many absurdities that he had to be put in the lunatic asylum. Typhoid bacteria had made such ravages in his brain as to produce a permanent injury in his mental personality.

This last case forms a transition to ordinary mental disturbances. I wished to show by my selection of cases that in diseases of the germ there are all the intermediate steps between inherited peculiarities

and diseases of the individual. At the same time, these examples illustrate the whole chain of ontogenetic abnormalities in a human brain. We can say that in so far as injuries of the germ, the embryo, or the child affect the brain, they all produce more or less deep and lasting arrests of its mental development. There is thus a pathology of inheritance which forms a transition to the pathology of the adult through that of the embryo and the child.

Let us close this section with the assurance that in every moment of his life man is the joint product of his inherited tendencies and the adjustment and education or habit of his life. "Inheritance" on the one hand and "habit" or "practice" on the other designate two immense groups of factors in the development of the brain which are always present, and it is often impossible to say what must be ascribed to the one and what to the other. If a child lies or steals, for example, it is often very difficult to say how far it is a matter of inheritance, habit, learning, or autosuggestion. A great deal of what appears to be learned or acquired really rests on a native disposition which only requires a slight impetus to develop it, such, for example, as Mozart's musical genius in early childhood. To judge aright we must constantly think of both acquirement and native tendency. In the diseases of the germ equipment (Keimanlage) we thus find a link between inherited tendencies and influences which come from without during one's lifetime.

We cannot make any greater mistake than to set up an artificial opposition between these two great sets of influence which mould the ego. It is a mistake to expect everything from education, and another to regard everything as predestined and fated by inheritance. Any one who brings forward only one set of these factors in some learned theory only displays his own ignorance or bad judgment. We do not need to be learned to recognise both sets of factors; for they are seen by every thinking man.

(2) *Race History or Phylogeny. Darwinism.*

Phylogeny means the history of the class or family. The term was introduced by Haeckel, and is based on Darwin's theory of descent. It is now well-established that different species of animals and plants have a common origin, and were gradually transformed in the course of many generations. Phylogeny seeks to ascertain the characteristics of the common ancestors of species and groups of species now living. To be sure there is still a dispute as to how much importance we shall attach to natural selection as a cause of the transformation of species; for this involves other factors too. But the geographical distribution of plants and animals, comparative anatomy and ontogeny, and the study of fossils no longer leave any doubt as to their common descent. Palæontology has brought to light, amongst other things, remains of primitive men (Neanderthal and Spy skulls) who had a considerably

smaller skull than the men of to-day. Moreover Dubois has found the fossil remains of a being (*pithecanthropus erectus*) that apparently lies exactly midway between man and the anthropoid apes orang-outang, chimpanzee, gorilla, etc.). Thus we may well say it is settled that man is descended from a kind of being which was itself descended from lower apes, and this in turn from creatures something like a bat. The further phylogeny of animal forms has no interest for us here; but that of the human brain has. That the development of the brain is on the whole parallel with that of intelligence can be inferred from the size of skull cavities. The upper brain cavity of the pithecanthropus contains 570 cubic centimetres, that of a large orang-outang something more than half of this, that of the Neanderthal skull 920, that of a contemporary man (not counting the space occupied by the cerebellum) about 1000 to 1200.

Much has been said in previous chapters which agrees with this phylogeny.

What we are about to say is important for the hygiene of the nerves. We have seen that our brain possesses lower centres which, like the spinal cord, are relatively further developed with the lower animals than with man, and which indeed with the lowest outweigh the cerebrum. There is no doubt that they are the organs of our lower animal impulses and instincts. With reference to these we can well be compared with other mammals. What distin-

guishes man the most is the enormous development of the cerebrum, which exercises much more control over the automatisms than in any other animal. Yet with the higher vertebrates also the cerebrum plays a great part, as we can see from Goltz's dogs and the brainless pigeons already discussed. Now it is important for the hygiene of our brain to find out the mode of life of our nearer human ancestors the relics of whose culture are given by ethnological discoveries. From these as well as from history we learn that primitive man, like the savages of our own time, lived in small communities which were at constant warfare with each other, with horrible bloody hecatombs, revealed to us by murderous weapons and broken bones. So we may well say that for thousands if not for millions of years human nature has been adapted to the hardest fights, to muscular exercise, work, and agility. The battle of the strong was won more and more by intelligence; and from this we can explain the enormous growth of the cerebrum. Verbal speech of course grew up at first very slowly and, so long as it permitted of nothing better than verbal tradition, it did not permit of any far-reaching culture. Only the implements of culture—pictures and writing—could make it possible for descendants to gain permanent benefit from the experience of their ancestors and to advance upon it. Writing and printing at last became the main implements of civilisation and made possible its perfection without a corresponding enlargement of the

brain; for with the knowledge and experience of one generation stored up in books the next could add something to it without such great demands upon their mental powers. Schopenhauer calls books the paper memory of mankind. Our brains to-day may not be any larger than those of our ancestors three or four thousand years ago, but schools and libraries enable us to do a hundred times more with them.

The products of human culture have reacted on mankind to bring people nearer together, so that the original small communities have gradually given way to little kingdoms, then larger kingdoms, then empires, and finally world-empires. Commerce has led to connections and intermixtures between different races and nations. The nature of war has been totally changed, and it is no longer the favourable selective agency that it once was.

From this we can easily see how primitive man in spite of his few and limited social instincts and his abundant instincts of the beast of prey could be compelled in a short time to set limits to his narrow-hearted conflicts of clan and nation and race, and not only deepen but broaden his social feelings. This situation has produced a growing discord between our inherited wild-beast instincts and our present social needs; and in this discord we find the root of our present social struggles.

The lust of fight and strife, greed and envy, are thus phylogenetic peculiarities which our germ plasm has inherited from primitive human ancestors, and

they cannot be abolished by theoretical analyses or phrases and dogmas. Only a plucky diversion of such impulses into useful social work and a proper selection of the stock can help, and that too very gradually. But such help is indispensable, for culture cannot be permitted to go backward, and man must adapt himself to a general peace and yet avoid the degeneration which would be the inevitable result of inactivity.

Knowledge of the phylogenetic facts here briefly outlined is of great importance for the hygiene of the brain.

Some interesting and lasting suggestions are to be gained from the highly developed social communities of certain lower animals, such as bees and ants. Far as these creatures are removed from us in bodily organisation, it is surprising to find that their highly developed automatic cerebral activity has produced phenomena so similar to our own social relations that we give them the same names; wars and alliances, slavery and cattle-breeding, and the fungus gardening of many ants. Such phenomena converge with others in pointing to the existence of general natural laws of society for living beings. They are only analogies, to be sure; but they can be used for the discovery of deeper common causes.

Phylogenetically, as we have seen, the cerebrum is developed from the smell centres of lower vertebrates. A consistent adaptation of sense-organs to the conditions of life, and of nerve centres to sense-

organs and movement, can be inferred from comparative anatomy and biology; and what we learn about it there sheds a wonderful light over the whole primitive history of the living world for those who take the trouble to dive deep into contemporary zoölogy and botany. He who does not disdain to make a special study from his youth of any small branch of these sciences, if only for pleasure and recreation, will gain an insight into the natural laws of life which to others will always remain closed. But he should study not only the classifications but the anatomy, biology, and geography of those living forms which he has chosen as a specialty. Yet here is an important question. The name Darwin is nowadays in every mouth. By explaining the transformation or evolution of species through "natural selection" and the "struggle for existence" between different animals and plants, this great scholar introduced the theory of evolution into science and gave an unprecedented impetus to natural history. That through the artificial selection and pairing of the possessors of certain peculiarities these peculiarities can be made to increase more and more in the descendants stands absolutely established. This is proved by the varieties and stocks of plants and animals produced by artificial breeding. And it is no less well established, as any one can see who keeps his eyes open, that in unrestrained nature animals and plants are engaged in a constant desperate struggle, consuming and effacing each other, and that thus the stronger

or more cunning, or more nimble or dogged or prolific gain the upper hand, often merely through a slight peculiarity that happens to be especially advantageous. That is the struggle for existence, and it produces a natural assortment or selection of powers of resistance. These are incontestable facts, and to me it is simply inconceivable that in modern times any tendency which amounts almost to a denial of it can succeed.[1] But, on the other hand, the investigations of the last decades have indisputably proved that in the production of species, or transformation of forms, a part is played by still other factors, which are very different, such as warmth, cold, and the chemical constitution of foods; they have proved that evolution does not always proceed uniformly, but now moves quickly, now slowly, and again often stands still for a long while; and they have proved that still other deep inward factors, of which we know nothing at present, must co-operate in the variation and creation of species. I refer the reader here only to the theory of mutation of the botanist de Vries.[2]

[1] See Piepers: "*Mimicry, Selektion, Darwinismus;*" Fleischmann, and others.

[2] According to de Vries, variations of this sort which occasionally arise suddenly from within are what produce new species, while bastardising, or crossing, and selection through various kinds of unfolding of germ-powers already present only produce varieties and breeds which develop nothing fundamentally new and continually return to the type of the species. If the reader will compare the phenomena of engraphy (see below) with this he will understand that in this case, as in many others, there is no opposition, but only a combination, of factors. In Chapter VIII. in connection with the term *Blastophthory* we shall see how certain poisonings of the germ plasm tend to be inherited. And in the same

From this a gross but common sophism, against which too much warning cannot be given, has arisen and become a sort of shibboleth. It rests upon a falsification of the conception "Darwinism." Under this term two conceptions are intentionally or unintentionally confused. (*A*) *The fact, now unconditionally proved, of the transformation or evolution of species, which are thus ancestrally related; and* (*B*) *Darwin's special hypothesis that this transformation has taken place exclusively or almost exclusively through natural selection.*

All enemies of science and worshippers of mysticism rush into this misunderstanding and use it to persuade those who are incapable of judging that *A* itself is incorrect, saying, "Darwinism is no longer accepted," "has shown itself false," etc. Of course the only truth in this is that hypothesis *B* no longer suffices for the explanation of *A*.

Now in the very latest times there has come a ray of light, to which we must devote a few words. Proceeding from Ewald Hering's ingenious idea that "instinct is, so to speak, a race memory," Richard

way the chemical constitution of the germ tends to be transformed by warmth, cold, light, and the chemical constitution of the water or air (Standfuss). If the transformation or reconstitution of the species is favourable for the perpetuation of the stock in the struggle for existence, it increases; if it is more or less indifferent it can at least continue to exist; but if it is directly hurtful it is wiped out. Against this simple fact no theory can hold out, however much the newest fashion may agitate against selection. And the intensity of the struggle for existence can be shown to-day in the annihilation of interesting island animals, often of whole species of them, by stronger continental species that are carried there on ships.

Semon [1] gives a convincing proof that here it is not a matter of mere analogy but of a deeper identity in the organic process. In order to escape physiological terminology, he invents new terms for the general notions attained, which he bases on a careful definition of the conception "stimulus."

By stimulus he means an "energetic" influence upon the organism from its condition or constitution (Beschaffenheit) which calls forth a series of complicated alterations in the stimulable or "irritable" substance of the living organism. The altered condition of the organism (which lasts as long as the stimulus) he calls a "condition of excitation." Before the action of the stimulus the organism (so far as this stimulus is concerned) is in a *primary,* afterwards in a *secondary, condition of indifference.*

If now, after the stimulus has ceased to act, the irritable substance of the living organism shows itself permanently altered into the secondary state of indifference, Semon speaks of an *engraphic* action. The alteration itself he calls an *engram.* The sum of both inherited and individually attained engrams is what he means by his "*Mnema.*" By *ecphory* he means the recall of the whole condition of stimulation, which had been produced in the organism by a set of simultaneous stimuli, by a part only of these stimuli or by all of them in a weaker form. This expression corresponds to what we know psychologic-

[1] "*Die Mneme als erhaltendes Prinzip im Wechsel des organischen Geschehens.*" Wilhelm Engelmann, pub., Leipzig, 1904.

ally or introspectively as association and memory. In this way, engrams are ecphorised. In every process of this sort, the whole mnemetic excitation (or engram complex) chimes in with the simultaneous condition of excitement produced by the new stimulus; and Semon calls this harmony of the two "*homophony.*" If any incongruity presents itself between the new stimulation and the mnemetic excitement harmony tends to be re-established, introspectively by attention, ontogenetically by the process of regeneration, and phylogenetically by adaptation.

On the strength of convincing facts Semon now shows that stimulations are only at first and to a relative extent localised in their own primary sphere (the region at which they entered), but then radiate or die out in the organism as a whole, not merely in the nervous system; for the same thing takes place with plants. In this way, a nervous engraphy can at last affect the germ cells, even though the influence be tremendously weakened. But Semon shows further that engraphic influences of a very weak variety can become ecphoric after innumerable repetitions (phylogenetically, after innumerable generations). And so the possibility of an exceedingly slow inheritance of acquired characteristics after innumerable repetitions can be explained by the mnemetic principle without impeaching the correctness of the facts adduced by Weismann. For of course the influences of cross-breeding and selection work ever so much faster and more strongly than

individually inherited mnemetic engraphies. The latter in return might explain de Vries's mutations.

Semon's consistent elaboration of these ideas in morphology, biology, and psychology is illuminating; and the new perspectives which it gives are magnificent. Mnema works with the aid of external influences, preserving and combining through engraphy, while selection discards all that is badly adapted. The true building material of organisms is thus afforded by stimulations from the outer world. I admit that I have now been converted by Semon to what is at last an acceptable idea of a tremendously slow inheritance of acquired characteristics. Instead of several hazy unknowns we have to do with only one, the nature of mnemetic engraphy.

If we now turn back to A and B [the two doctrines of evolution and selection], it is evident that what was not possible to selection alone must now have been brought about in time with the aid of mnemetic engraphy. For the rest, we shall not know what we suppose to be the mechanical laws of life so long as we ourselves are unable to engender a living being from a lifeless substance. And thus the mechanicians should let their vital mechanics rest so long as they have no basis for it, and the "Neovitalists" should spare us their silly hypotheses (for example, the Dominants of Reinke), which are nothing more than empty words.

Thus A, the evolution or transformation of species, is a fact which stands fast. But we can be quite as

certain also of certain further facts: C, artificial and natural selection; D, the struggle for existence; and E, mnemetic engraphy; with the physical and chemical factors of evolution and the mutations which might arise from them. From this it is evident that B does not explain everything and must be accepted only as one of the principal factors in evolution. But it still remains true, and that is of enormous importance for us, that B is partially decisive, especially for varieties and breeds within a species, as de Vries himself recognises. Artificial selection alone is enough to show this. And thus we are certainly in a position to wage a successful war against harmful factors in our own species and to preserve and breed the properties which are useful to it. To neglect this important fact of which we can be sure for the sake of doubtful hypotheses, or to try and talk it to death or cheat it out of existence, is an undertaking ruinous to society. By selection in the human race we *could not and would not reconstruct the species,* and we do not claim to control *all* the factors of our mental cerebral development. But with its aid we might weed out thoroughly bad stocks and by perpetuating the good without the bad make them continually better. This is quite enough for us here. Engraphy works with us for future centuries and must give us the hope of a broader and higher structure of our cerebral powers for the very distant future of our race, provided always that we do not destroy this infinitely slow ant-like work in short order by false selection and blastophthory (see Chapter VIII.).



PART II

PATHOLOGY OF THE NERVOUS LIFE



CHAPTER VI

GENERAL CONCEPTIONS OF MENTAL AND NERVOUS PATHOLOGY

ON the strength of an old dualistic prejudice according to which the mind is regarded as something different from the brain, a distinction has been made between mental and nervous diseases. This was a most unfortunate error, and even to-day in the public mind the notion of mental disease awakens visions of the madhouse and the attendant's keys. Even severe cases of mental disease are always referred to most naïvely as "nervous troubles" by the friends of the patient; who are greatly offended if any one ever uses the word insanity. Now to be sure we have no idea of maintaining that every nervous disease bears the character of a mental disease in the peculiar sense of the word. Yet the preceding chapters must have made it clear to every one that every disturbance of the central nervous system (even disturbances of the eye or the ear) involves mental functions; though only a general disturbance of the cerebral activity is able to seriously affect the personality, the ego, as a whole. But the converse is absolutely true: *Every mental disturbance rests upon*

a disturbance of cerebral function. Whether this disturbance is serious enough to affect the man's responsibility in a legal sense, and his own interests and the interests of society demand his confinement in an asylum, is a question of purely administrative utility and has absolutely nothing to do with the purely scientific conception of mental and nervous disease. Very many people mentally affected are at large and do not require to be confined.

It should be clear also from the first five chapters that diseases which affect only the peripheral ganglia are scarcely regarded by the public as nervous diseases at all; for at most they cause only a very limited pain or motor disturbance. Lepers suffer from swellings of the peripheral nerves, but because the nerves are peripheral their disease is not classed as nervous but as infectious. Zoster is an inflammation of a peripheral nerve and causes pain and blisters. It was long regarded as a skin disease before it was known that it resulted from nervous inflammation. Diseases of the retina are typical diseases of a sensory nerve, but they are classed with eye diseases, not with nervous diseases; and so it goes. When people speak of nervous diseases every one of the peripheral nerves is almost always absolutely healthy. The name is therefore fundamentally wrong. The most common so-called nervous diseases really rest on disturbances of the cerebrum, and only a few definite sorts on disturbances of the spinal cord or subordinate cerebral centres. In these latter cases, of course,

when the cerebrum is unaffected the mental functions remain completely normal. So-called "nervousness" and all that is known to-day under the general term "Neurasthenia" is an exclusively cerebral disturbance and far more closely related to mental disturbances than to diseases of nerve-centres outside of the cerebrum.

But all disturbances of the cerebrum are reflected in the functions of the senses and the muscles; for we have seen that the functions of the senses are not known to us until they have been carried over into the cerebrum and that the principal functions of our muscles are directly controlled by the cerebrum. The error and confusion in our conceptions arise from the fact that the cerebrum projects its impressions and perceptions outward to or beyond the surface of the body (see the case of amputations, already referred to), and that we infer the cerebral activities of others from their muscular movements. So people came everywhere, with themselves as well as with others, to locate in the periphery of the body what belongs essentially to the brain. Yet on the other hand, since the brain receives its impressions through the sensory nerves and issues its commands through the muscles, every distinction of diseases of the nervous system into those of brain, spinal cord, and peripheral nerves is more or less artificial and arbitrary. We shall therefore neglect the distinction as far as possible. Local destructions and disturbances take place, no doubt, in the nervous system; but their

effect spreads over the whole nervous structure functionally united with the part destroyed or disturbed.

The nature of the disturbance is a much more important thing to investigate. It is not indifferent whether one has to deal with a destruction of neurones or only with a disturbance in the current (or wave motion) of the neurokym in otherwise undamaged nervous substance. Further, it is highly important to find out whether a given disturbance is merely temporary or permanent. Then, too, certain ascertainable causes of nervous disturbances are of great significance, such as poisoning or bacterial infection; and, finally, it is a most momentous question whether the trouble was present in the embryological life, in the germ, or even in the ancestors. Thus we shall not attempt to present our sketch of nervous diseases according to any definite system, but to give the most important actual occurrences. It is really amusing to see in many text-books of mental diseases on the one side and of nervous diseases on the other to what a great extent the very same conditions and troubles are treated from the more or less different standpoints of the authors. If they would only say why they regard one and the same disease now as mental and now as nervous!

By organic pathological changes we mean those which are associated with a disturbance which is demonstrable anatomically, or at least with a visible disease of the nervous tissue. This destruction or disturbance can be *local,* affecting only a limited area of

the brain, of the spinal cord, or of a nerve; or it can be diffuse. In diffuse diseases, single neurones or parts of neurones here and there in the nervous tissue are diseased or shrivelled throughout the whole extent of the nervous system or at least in large portions of it. Diffuse diseases are on the whole much more serious than local, though not so easy to demonstrate in an autopsy. This is not difficult to understand, for they cause more or less disturbance in the functions of all neurones, while with a circumscribed local lesion the whole of the rest of the nervous system can function normally. We saw above that neurones once destroyed can never be restored. That is why all organic nervous troubles are so serious and generally incurable. They are only curable when they are the result of transitory bacterial infections, inflammatory exudations, or the like, which drag or press upon the neurones for a short time but do not destroy them. Yet sometimes they are curable to some extent, because many of their symptoms are due to tensions or pressures which they produce at first in surrounding parts of the brain, but which may afterwards subside, and still others, such as paralyses or lamenesses, may be due to autosuggestion.

By functional disturbances we mean those which do not rest upon any perceptible anatomical changes, *i. e.*, those whose material foundations in the central nervous system we cannot recognise at all anatomically. It is a doubtful expression, for it is clear that no functional disturbance could take place without at

least a molecular disturbance in the neurokym, and this in turn is not conceivable without some change in at least the chemical action of the living nervous substance. And so perhaps it would be better to say "curable" instead of "functional," or, better still, to speak directly of disturbance of the neurokym; which implies that the nervous tissue is intact.

The matter is further complicated by the fact that many nervous diseases which must be regarded at first as functional become after a time organic—that is to say, they produce permanent, though perhaps slight symptoms of shrinking in the nervous elements. And that raises a question which is for the most part still unsolved: Was the long-continued functional disturbance the cause of the final degeneration, or was there not from the very first an exceedingly fine anatomical alteration of the nervous tissue which is not to be detected even under the microscope and only becomes recognisable after it has lasted a long time and produced a noticeable shrinking? The latter view would appear to be decidedly correct if it were not for the unexpected cures that often take place, even after many years, and thus make the other in turn more plausible. We must look for light to the future. In what follows we shall adhere for the sake of brevity to the terms "functional" and "organic" in the senses just explained, but request the reader to constantly bear in mind what we have said about them.

Disturbances of Sensation. Every kind of sensation can be disturbed in any of three ways:

(*a*) The sensory reaction is diminished, perhaps to the point where it is lacking altogether. This is *subsensitiveness,* or hypoæsthesia or, in the extreme case, *insensibility* or *anæsthesia.*

(*b*) The sensory reaction to a stimulus is exaggerated or the sensation arises without any peripheral stimulation at all. This is *hyperæsthesia* or *supersensitiveness,* amounting in the extreme case to *elementary hallucination.*

(*c*) *Paræsthesia* or *abnormal sensibility,* where strange, unusual, pathological sensations arise.

These phenomena may take place in the sphere of any sense and rest on either organic or functional disturbances. For example, the patient can no longer feel even the prick of a pin. This is an anæsthesia of the skin. A slight sound is felt strongly and painfully. This is auditory hyperæsthesia. One feels ants crawling over one of his limbs or it goes "asleep" (tactual paræsthesia); or his ears ring (auditory paræsthesia). Pains of all sorts without corresponding organic causes belong to the sphere of hyperæsthesia. Ringing in the ears and seeing flashes of light can be classed as elementary hallucinations when they have no outward exciting cause. Yet the distinction is more theoretical than practical, for peripheral stimuli cannot usually be pointed out in cases of paræsthesia.

Disturbances of Perception, or Hallucinations and

Illusions. These are best called, with Kraepelin, *false perceptions* (*Trugwahrnehmungen*). If the patient sees, hears, or feels things when in reality no corresponding stimuli have affected his eyes, ears, or skin this is called *hallucination* (for example, when he hears the voice of an acquaintance who has not spoken or is not there at all). By *negative* hallucinations, on the other hand, we mean the disappearance of the sensation though the stimuli really do affect the sense-organs. When I fail to see the man who stands before me in full daylight, though my eyes are sound and open, I *hallucinise* him (as the Germans say) negatively or hallucinise him away. This can be very prettily demonstrated in hypotism. By *illusion,* positive or negative, we mean an incomplete hallucination, in which, for example, one sees some friend with a black face, fiery eyes, and horns on his head, when the friend is really there, but the diabolical accessories are not. A mentally diseased person once had a negative illusion and saw the muskets of a company of soldiers suddenly disappear. Many are the illusions of hearing, in which, for example, one hears human voices in the rustling of the leaves or the song of birds.

By *reflex false perceptions* we mean false perceptions of one sense which are called forth by normal perceptions of another. Thus one of my patients always felt blows from a stick when some one rattled the key in the door.

One can also have hallucinations of movement,

and perceive, for example, movements of his own body which have not taken place at all. Those senses which do not form any sharp space and time associations (smell, taste, and the visceral feelings) cannot call forth any genuine false perceptions, but only paræsthesias and elementary hallucinations. But these very visceral feelings give occasion for those whimsical cases in which patients declare that they feel all sorts of wonderful things in their heads or bodies, because they wrongly interpret their vague paræsthesias.

Delusions, and Deceptions of Memory. An insane delusion (*Wahn*) is in itself a diseased judgment, but it is generally also associated with pathological voices, paræsthesias, false perceptions, and the like. The distinguishing feature of an insane delusion is its incorrigibility; by that it is distinguished from normal error, but not always sharply distinguished from superstition. It is caused by deep pathological disturbances of cerebral functions, which more or less alter the foundation of the ego or spiritual personality. A patient sees the photograph of the Emperor of Germany. Suddenly it is clear to him that this is his father, and now he believes that he is crown prince. From his intuitive, wholly inner prompting no reason can dissuade him, and he goes to Berlin to see his father, the Kaiser. That is a delusion. A person who is mentally sound has a vision (*i. e.*, a visual hallucination), but he stands up and convinces himself that it is a deception and thinks to

himself that his nervous system is excited. He corrects the matter. But if he is mentally ailing he believes in the reality of his vision and explains it by some false idea, which becomes a fixed belief. Yet delusions can also arise through mysticism, spiritualism, and superstition, and from many kinds of suggestion without the presence of any cerebral disease. So that whether a delusion (*Wahnglaube*) is diseased or not must depend upon the other symptoms and above all upon the cause which aroused it.

Imperative Ideas (*fremdartige Zwangseingebung*). Patients often explain that they are suddenly overpowered by some thought which they ascribe to a foreign supernatural power, and which then generally becomes the beginning of a systematised delusion. Such a one said to me that certain words had been smashed into his head (not through his hearing).

By a *false recollection* (*Erinnerungsfälschung*) we mean the recollection of something which one never experienced. It is a kind of hallucination of memory. Whole chains of events which the brain creates at that very moment are imagined as past experiences, and the patient swears with the deepest conviction that he has been all through this or that; and not a single syllable is true. If what the patient imagines is a complete invention, we call it an hallucination of memory (*Erinnerungsfälschung*); if purely imaginary accessories are added to what actually took place, the error is called an illusion of

memory (*Erinnerungsverfälschung*), according to Kraepelin. The false conviction that some present experience is the exact repetition of something that took place once before is called a case of *paramnesia* (*Erinnerungstäuschung*). Hallucinations of memory are much more numerous than we generally suppose, and play a large part in the delusions of the insane. But they are also commoner than we suppose with the sane; and this is still more true of illusions of memory. The sound man, however, can correct them; the unsound usually not. Yet the sound man often has a way of regarding other people's illusions and hallucinations of memory as lies, while he overlooks his own.

Disturbances in the flow of ideas (*Gedankenablauf*) are also important. The retardation or total inhibition of thought we find especially in *melancholia,* and the hastening of thought or a rush of ideas in *mania.* The former is associated with a general inhibition of brain action; the latter with its general stimulation.

Disturbances in the *association of ideas* are extremely various and complicated. It would lead too far afield to analyse them here. In light cases, for example, a lack of logical connection can be shown by the fact that the association is determined more by the sound of the words than by the sense. When some one speaks, for example, of strain, the maniacal patient goes over to the notion of a train, because of the likeness in sound. By *stereotypia* we mean the

constant repetition of the same phrases, gestures, or trains of ideas. By *insistent* or *imperative ideas* (*Zwangsvorstellungen*) we mean ideas which press persistently and overpoweringly upon the attention, so that they can no longer be set aside, but pursue one day and night. Certain *associational disturbances* affect the association of words more than that of thoughts, and give rise to senseless verbal gabblings, or senseless speeches, which, however, are not based on any corresponding confusion of thought. In more serious cases of associational disturbance the patient becomes completely incoherent in his thoughts, as well as in his speech. In *mental incoherence* not only the thoughts but also the feelings and voluntary impulses are apt to fall into chaos, and the patient wanders and moons about as though lost in a dream. Indeed this dissociative condition is akin to dreams.

It is extremely important to distinguish dissociations which rest upon the disturbance of organic tissue from purely functional incoherence (*Verwirrtheit*) resting upon some disturbance of the neurokym. The organic dissociation is in reality something very different. In the case of functional dissociation it is mainly the content of consciousness that is confused, while all the subconscious automatisms usually work away in normal, safe, and good associations. But in organic dissociation, on the contrary, we find a disruption of the unconscious brain-life, while the associations in the content of consciousness

may be tolerably well preserved. In a case of organic dissociation the patient may carry on a conversation more or less logically and follow a line of thought; but at the same time he will forget where he is, where to look for the door of the room, or that he is in a parlour full of company; he will perform all sorts of private functions in public, or let out secrets which he formerly kept deeply concealed, and perhaps make some absurd bargain that seems to him very advantageous because he overlooks a vital point that is clear to everybody else. On the other hand, the functionally deranged (*Verwirrte*) usually avoid such stupidities instinctively and subconsciously in much the same way as we keep ourselves properly covered in a dream. The whole instinctive mechanism, including habit, is thrown into no confusion, or into much less. In cases of organic dissociation you can fairly lay your hands upon the gaps in the connection of the brain elements. The whole work of the brain goes on in accordance with the usual rules, as in any waking condition; but it stumbles every moment over gaps in the subconscious associations which are carried on perfectly automatically in normal people, for now they are full of all sorts of gaps and disturbances. The patient overlooks and forgets the very thing that is normally never forgotten because it takes care of itself mechanically. For the rest, organic dissociation usually connects itself with uncertainties and coordinational disturbances of voluntary movements and of speech, which have exactly the same cause, to

wit: lesions scattered throughout the nervous tissue. When, for example, a "*paralytic*" says or writes "Conisople" for "Constantinople," and his speech constantly stumbles in this way over syllables and words, these broken syllables give a kind of phonogram or graphic picture of the organic dissociation. Needless to say, there are all grades of this from the lightest disturbance to the complete destruction of the brain life. In the latter case not only all automatisms in thought, feeling, and movement, but also the whole higher content, the soul, is shattered beyond recognition.

Memory Disturbances. These belong partly with the foregoing, especially with the organic disturbances, which have much in common with dissociation. On the other hand, the functional *amnesias* or losses of memory are *sui generis*. They can be partial or complete. For example, one can lose the use of a language; or perhaps a whole section of his life is forgotten. Again in "psychic epilepsy," one often has only a vague recollection, as from a dream, of what took place during an attack.

By *double consciousness* we understand rare cases in which a person leads two different lives connected with each other by no recollection, no conscious bridge. The most peculiar cases were those of Macnish and Azam, in which the patients fell alternately from condition A into condition B, and in each one knew nothing of what had taken place in the other. I refer those who are interested in these things to my book

on hypnotism (Encke, publisher, Stuttgart). I myself observed and cured by hypnotism a very instructive case of amnesia which had lasted eight months and in which the patient had totally forgotten a former residence in Australia. In the book referred to the reader can find a description of the case by Dr. Naef.

Disturbances of Disposition and Feeling. These play a prominent part with the mentally diseased. Pathological gloom or sadness is found especially in melancholia. It is usually associated with a deep inhibition of the current of thought and of voluntary impulses, and can be distinguished from normal sadness by its connection with other symptoms such as fear and oppression of mind (*Angst und Beklemmung*), and by the lack of an appropriate cause, as well as by its duration and stability. Pathological happiness and lightmindedness is found especially in mania and progressive paralysis of the brain and is usually associated with a rush of ideas (*Gedankenflucht*). Still more important is the mixed emotion, the high key with two variants—a *fevered sadness* and a *fevered exaltation.* In this the ego reacts vigorously to the discomfort or disturbed comfort and calls out a contrary mood by way of exchange. The high key can rise to fury and shows all varieties of corresponding emotions, such as envy, revengefulness, suspicion. All these feelings associate themselves with false suppositions, delusions, and other diseased cerebral conditions and usually break out

against innocent persons, who often suffer untold miseries thereby. Through it all the patient may proceed with the utmost cunning and consistency, dissimulate with accomplished perfidy, and carry through the most fearful crimes. There is a whole set of other feelings, also without adequate normal cause, which can arise with corresponding impulses from pathological conditions in the brain—*e. g.*, fearfulness, feelings of pressure or burning, and perverted feelings of hunger or sex.

By *apathy* we mean the lack of a normal feeling-reaction. After long-continued mental disturbances this is the rule. The weakening, amounting perhaps to total loss, of conscience and altruistic sympathy which is developed sooner or later in most mental diseases is very important. This is briefly designated as the ethical defect.

Disturbances of will and movement are manifold. By *abulia* we mean the suspension of the power to will; by *impulsiveness* the quick, unconsidered, and irresistible translation of feelings and thoughts into thoughtless acts devoid of all consistency and perseverance. A general, more or less confused excitation of will indicates *mania*. By imperative impulses (*Zwangsimpulsen*) or forced acts (*Zwangshandlungen*) we mean absolutely abnormal, senseless impulses which impel forcibly to conduct. I know a patient who had the groundless impulse to cudgel or strangle people and in desperation she herself warned her victims; and it is very common for

patients to carry out some absurd performance either automatically or under the influence of delusions.

The general characteristic of the mentally diseased, as contrasted with those who are at least partially sound, is the lack of insight into the abnormality of their own condition. This rests on the alteration of the whole personality, and this in turn upon diffused changes in the functioning of the brain, as a result of which the outer world and other people impress it differently, and the patient attributes this change to them and not to himself. We have absolutely no other criterion of mental disease. But it is evident that this criterion can be only relative; for the insight can be partial and incomplete, no less than the disturbance in the brain. Sharp boundaries are not to be found here any more than elsewhere in nature, and perhaps not even so much. On the other hand, a partial disturbance of mental function (which in that case cannot be spoken of unqualifiedly as a mental disturbance) can be accompanied with a perfectly clear insight.

Nervous Disturbances which are not Mental Disturbances. Many of the nervous disturbances which we have mentioned can be circumscribed and appear when the general mental health is otherwise tolerably good. And now we must briefly enumerate those disturbances which on the whole affect the cerebrum only partially and locally or perhaps not directly at all. They rest upon fundamentally the same affec-

tions of nervous tissue and its functions as the others just mentioned.

Pains, paræsthesias, and even false perceptions may have their cause in stimulated conditions of the lower brain centres, spinal cord, or sensory nerves. *Inflammation of the nerves* or *Neuritis,* as, for example, in zoster, can call forth frightful pains, which, of course, are only felt when the current is conducted to the brain. The same pain can have an organic or a functional cause, like toothache, which may be due to an inflammatory process in the teeth, or be purely functional (neuralgia). I treated a patient who had previously had for two weeks a very painful infectious inflammation of the urinary passages attended with suppuration. Two years later he had a slight mental attack of hyperæsthesia and at the same time entered upon a course of conduct which might easily result in a new infection. Through anxiety he suggested the disease to himself to such an extent that for two weeks he underwent all the pains and stages of the disease in question, although the most careful investigation on our part proved the absolute integrity of the urinary passages. After he recovered, the man, who was educated and reliable, said that the second attack (the purely functional result of autosuggestion) had been at least as painful as the first (caused by suppurative inflammation). This case shows more clearly than any theoretical discussion how in the sphere of sensibility and pain a functional stimulation of the brain has the same effect

as the worst irritation of a peripheral nerve. On the other hand, I myself have suffered for the last six years from ringing in the ears caused by a chronic dry catarrh of the middle ear. Yet I have succeeded in diverting my attention so completely from it that, as a rule, I no longer hear it except when I think directly of it, through association.

Functional nervous complaints are, as a rule, much more painful, vexatious, and hard to bear than organic. The intensity of a pain or suffering is in general by no means proportional to the stimulation of the peripheral nerve, but is dependent to a much greater extent upon the condition of the brain. If I am " nervous," *i. e.*, in a somewhat pathological condition, through loss of sleep or mental tension, the slightest stimulus pains and vexes me. If, on the other hand, I have become dulled and hypoæsthetic through long tramps and other muscular fatigues, then wounds and inflammations cause little pain and I can even bear rather serious bodily troubles with relative indifference.

The vaso-motor nerves, whose ganglion-cells are to be found in the sympathetic ganglion nodes, can cause pallors in different parts of the body by the stimulation and contraction of the vascular muscles, and on the other hand they can cause reddening and even bleeding by their paralysis. Through the brain and spinal cord thoughts can lead to a paralysing or stimulation of the sympathetic ganglion nodes, and consequently to blushing or blanching of certain

peripheral parts. Through disturbances of this mechanism many nervous disorders arise, such as chilblains, sweats, bleeding of the nose, chills and congestions, various disturbances of the reproductive organs, and, if it lasts long enough, nutritional disturbances in the part of the body supplied by the blood-vessels affected. In the same way there are peripheral ganglionic mechanisms which superintend glandular secretion, the action of the intestinal muscles, etc. These likewise can be influenced through the brain by ideas and emotions. Thus we can explain how constipation and a vast number of other disturbances of digestion and of menstruation can be produced through the brain, without having their cause in the place in which they appear. It is for the same reason that such disturbances can be cured by hypnotic suggestion.

Every destruction of a peripheral sensory nerve produces an anæsthesia, and every destruction of a peripheral motor nerve a complete degeneration and shrivelling of the muscles provided for by it; they atrophy. The same consequence follows the destruction of the ganglion cells from which the neurones of the muscle originate. When, on the other hand, only the communicating neurones of the brain to the muscular neurones are affected, there is only a loss of voluntary control. The muscles affected can still contract reflexly; they remain alive, but can no longer carry out any purposeful movement.

Cramps are involuntary muscular contractions.

When they are continuous, as in lockjaw and other forms of tetanus, they are called *tonic*. *Clonic* cramps, on the other hand, consist of a number of muscular contractions following rapidly upon each other, as in epilepsy, in hysterical attacks, and in very many other irritated conditions of the brain and spinal cord. Such cramps can be either local or general and can have either an organic or a functional cause. They arise from irritations of the motor or centrifugal neurones and can be occasioned by bleeding, inflammation, or shrinking in the brain or cord, as well as by an idea, or a mere storm of neurokym, as in hysteria. I hope that the first chapters will have made this clear to the reader.

Another kind of motor disturbance is *catalepsy*. In the lighter form, of warlike pliability, each limb retains the position that has been given to it and remains passive—ideas can no longer lead to movement. In the most extreme cases the whole body is stark and cold and apparently dead. *Lethargy* is a sleep-like asphyxia (or suspended animation), with limp, powerless muscles. These conditions may be purely functional or may be due to pressure on the brain, from internal bleeding, hydrocephalus, and the like.

Then there are various *disturbances of co-ordination* (disturbances in the sure and rapid combination and sequence of movements,) briefly indicated by the general term *motor ataxia*. When an ataxia is rhythmic, as in delirium tremens, it is called

tremor (*Zittern*); but when it is irregular and without rhythm it is called simply *ataxia.* Purely functional tremor occurs; functional ataxia seldom. A typical ataxia is *tabes dorsalis* or locomotor ataxy, due to a disease of the spinal cord. Many disturbances of co-ordination are to be found in speech; stuttering depends on a vocal cramp, which, in turn, may be occasioned by a series of shrinking processes in the brain and medulla oblongata. In St. Vitus's dance (*chorea*), again, there are involuntary, irregular, disturbing, unco-ordinated movements of a functional sort. We content ourselves with these examples.

Now for a few general remarks.

As in other fields of pathology so in the pathology of the nervous system, there are no phenomena whose roots are not laid in normal functions. All the disorders that we have described rest on an increase, decrease, annihilation, or dislocation of normal functions. The normal man has hallucinations in dreams. In our psychology we saw the source of deceptions of memory. Strong emotional impressions can cause transitory insistent ideas (*Zwangsgedanken*) with normal people; and muscular overexertion leads normally to trembling or *tremor* (*Zittern*). The abnormality thus consists of the fact that the reactions no longer correspond to the stimulus; they do not take place at all (paralysis), or exaggerated acts arise without appropriate cause and last too long, or the neurones controlling the act are permanently altered or even destroyed.

After what has been said it is easy to understand that nervous and mental disturbances can be acute, chronic, developmental, or hereditary, according to their nature and mode of origin.

They are *acute* when a nervous system which was healthy is more or less suddenly affected either organically or functionally. If the cause of the trouble then disappears or can be removed without leaving lasting disturbances behind it there is a cure.

They are *chronic* when the disturbing irritation arises slowly or repeatedly and stubbornly persists, when its causes continue, or even when the irritation itself leaves behind it lasting products, defects or irritations, which can only be removed with great difficulty if at all; for chronic diseases are usually totally or partially incurable. By leaving a permanent consequence behind it, an acute disease may become chronic.

Diseases are *developmental* or *ontogenetic* when they attack the individual during his development, whether as embryo or as child, and when they are intense or chronic enough to interfere with the development. Transitory affections of children or embryos do not belong here, but with the acute forms.

Diseases, finally, are inherited or *constitutional* (phylogenetic) when they were already contained as sickly tendencies in the plasm of the germ cells from whose union the individual arose. When this affects the germinal constitution of the cerebrum, the very nature of a person's character is sickly or diseased.

If the disease affects only the germinal constitution of other parts of the nervous system, then of course the ego, the whole mental being of the individual, is not usually affected, or at least vitally affected by it; though it may be to some extent when the higher senses are lost, as in congenital deafness and blindness; and yet the highly gifted Laura Bridgeman reached a fairly high mental development through a laborious education of her sense of touch, and there are a few other similar cases [such as that of Helen Keller, which is even more marvellous].

CHAPTER VII

SYNOPSIS OF MENTAL AND NERVOUS DISEASES OR ABNORMALITIES

Group I—Developmental Diseases (Ontogenetic Disturbances)

THE abnormal conditions here to be considered are all characterised by the fact that the mental or nervous life is disturbed or impeded somewhere in its ontogenetic development from the embryo to the end of the growing period and remains on a lower, childish level. The same injurious influences are operative here, to some extent, as in other groups, especially heredity; but, in consequence of the developmental arrest, the results are different and justify us in setting up a special group of diseases, though to be sure it cannot be very sharply defined. Thus the developemental arrest of the embryo in its mother's womb has a much more noticeable effect than that of a fifteen-year-old boy. The latter arrest is much more like the diseases of an adult.

Although this first group contains very different abnormal conditions, whose prognosis can be different also, yet on the whole the most important question is the *degree* to which the mental or nervous develop-

ment has been disturbed or arrested. Developmental arrests can be divided into either two or three grades, according to the standpoint of the particular writer.

First grade: *Idiocy,* or deep congenital anoia.

Second grade: *Imbecility,* or weakmindedness; a lesser degree of mental weakness.

Kraepelin distinguishes still a third grade, which he calls *Debility,* and which includes the lightest forms of weakmindedness. Since the laity are seldom willing to recognise these as pathological the erection of this third class may be justifiable.

Congenital mental weaknesses or congenital nervous arrests can also be divided into *organic* and *functional,* in the sense of the terms already explained.

A. Idiocy and Congenital Organic Nervous Afflictions.

Every kind of inflammation, deformity, bleeding, or chronic affection of the germ (such as syphilis) can cause local or more or less diffused defects in the brain, the spinal cord, or the peripheral nerves of the embryo and the child. There are therefore many totally different kinds of developmental arrest. We name:

1. *Cretinism.* Certain obscure causes (nature of the drinking water, inheritance, etc.) produce a disease of the thyroid gland (*goitre*), which on its part brings about what is called *Myxœdema,* a metabolic disease of the whole body, including the central nervous system. The well-known picture of the cretin

with the congenital peculiarities of his skeleton, his whole bodily form and his brain, which may be completely idiotic, seems to be "endemic" in certain regions, *i. e.,* to be bound up with some local peculiarities.

2. *Microcephaly* rests on strong congenital defects of the cerebrum, which often remains as small as one's fist. The skull remains correspondingly small, with a pointed, bird-like profile. The microcephalic idiot is usually lively and malicious, while the cretin is more mournful and quiet. Lannelogue confused cause and effect when he wanted to cure idiocy by trepanning or cutting out a part of the skull, for the smallness of the skull is not responsible for that of the brain, but *vice versa.* Experience shows that in growth the organ which is poorer in blood (in this case the skull) always gives way before one that is richer in blood (in this case the brain).

3. *Porencephaly.* When an inflammation, bleeding, or any other ravage wipes out a part of the tender brain of the embryo, the demolished mass becomes pulpy and is gradually absorbed by the blood. Then there remains a great hole filled with watery fluid, or serum. This is called *Porencephaly.* In accordance with what we have already learned about the anatomy of the brain, the consequences will differ according to the part affected. If, for example, the central convolutions (see Fig. 9) or the pyramidal tract running from them to the spinal cord is affected, then the patient can acquire only a diminished

voluntary control or perhaps no control at all of the leg or arm, or both, on the opposite side of the body. Yet strange to say this crippling is not the only consequence of the porencephaly, but the whole limb remains backward in its development, *i. e.*, short and thin like the limb of a child. When the patient grows up, he has normal limbs on one side and something dwarfed and wholly or partially crippled on the other. If, on the contrary, the seat of the trouble is in the visual or the auditory centre (see Figs. 9 and 10), then there arise corresponding disturbances in cerebral vision or hearing (see above), which of course last throughout life.

4. *Hydrocephalus* or water on the brain is the consequence of the exudation of water into the cerebral ventricles. The brain is pressed apart, and so are the skull bones. A slight degree of the trouble is compatible with mental efficiency if the brain-substance has not suffered. With higher degrees there come idiocy (*Blödsinn*) and arrested development. Hydrocephalic patients can be recognised at once by their tremendous skulls.

5. *Other Brain Defects.* There are a great many other kinds of defect in the brain, which sometimes depend upon original deformities in the plasm of the cell, and sometimes upon diseases of the embryonic brain. Unless the defects are small and localised they all lead to a more or less high degree of idiocy, as does the porencephaly already mentioned as soon as it is fairly large. Motor and sensory disturbances are

also associated with these defects according to the region involved. Certain defects in the brain are not visible to the unaided eye, because they are only caused by very minute alterations in the brain substance. Here the microscope decides. But the result is the same; for it does not matter much so far as consequences are concerned whether a group of neurones is completely destroyed or only completely blocked in its operations by microscopic alterations of the tissue.

6. *Idiocy in Apparently Normal Brains.* It must be admitted there are cases of idiocy, and very deep-seated cases too, where neither gross nor microscopic abnormalities can be discovered; but doubtless this is because of the enormous difficulty of microscopic investigations in the brain. It is wellnigh impossible to examine the whole brain exactly in a single autopsy, because only the most complicated methods of preservation and staining can exhibit the extremely fine texture of the ganglion cells and nerve fibrils, and then we often cannot be certain about what we see. What we recognise is usually only something very coarse.

Idiocy is a very vague and general notion. In different cases different mental faculties have been left undeveloped to different extents. Idiocy in the sphere of the feelings, which manifests itself now in dull apathy and again in passionate excitability, is very important. These symptoms are very common, and with them all the finer feelings, especially the

moral or altruistic feelings, are lacking. The idiot is usually a cross and brutal egoist, *i. e.*, a moral idiot. Idiocy in the sphere of the will can manifest itself through *abulia* (a completely passive, indifferent existence without impulse) as well as through *irritable weakness* or *impulsiveness of will.* The impulsive form is the worse. The patient quickly turns a feeling or idea into action, yet he lacks the perseverance to carry his resolutions through consistently; his voluntary impulses are only children of the feeling of the moment. In the sphere of knowledge the idiot shows his intellectual weakness especially by poverty of thought, by his inability to form complicated associations, his inability to grasp complicated relations, etc. According to the degree of his weakness he can learn speech, writing, and arithmetic insufficiently, barely, or not at all. Memory is not necessarily weak; with many idiots it is deficient, to be sure, yet there are others with a giant memory. But the incapacity to associate verbal and written images with the corresponding ideas is especially characteristic.

There are many varieties of idiocy. Commonly an idiotic child can be recognised very early, at least when the idiocy is at all great: The child is unstable, inattentive, with a vacant look, is wild and excitable or dull of sense, but above all restless, often destructive, and unclean. Yet the parents will not believe in a serious abnormality and continually hope for a mental development which does not come. The care

of idiots is an extremely thankless task. In the idiot asylums one often goes to tremendous trouble to teach little acts of skill like writing and reading; but it would be better to content oneself with cultivating the very simplest practical and useful attainments and habits of order and cleanliness. The main aim of the management must always be the protection of the individual idiot from himself and from the others and the protection of society from them all. This last is very important, for idiots are often extremely brutal, sexual, and otherwise dangerous. The speech of idiots is very characteristic, childlike, impeded, often spasmodic, and badly combined with the breathing.

The same ravages of nervous tissue which lead to idiocy when they occur in the cerebrum may occur in the spinal cord and lower brain centres; and then they produce all sorts of paralyses, reflex disturbances, and disturbances of vocal articulation and other complicated automatisms, of which the patient himself is conscious as a nervous disease or failing, but which are manifestly incurable because congenital. Deaf-and-dumbness usually rests on a congenital organic disturbance of the auditory centres or the auditory nerve. The patient does not speak because he does not hear, and consequently cannot make auditory symbols. But he is intelligent, and so he can be taught to understand what is said and even to speak, by the aid of the other organs of sense. Shrinking of the optic nerve in the embryo leads to an incurable congenital blindness. Congenitally

blind patients who can be cured by operations, as well as those who learn to see by means of the newly discovered radium rays, are those whose blindness is caused by a clouding of the refracting lenses of the eye while the nerve remains healthy. But before the removal of the clouded lens [the cataract], or before the action of the radium rays, these patients had never seen anything, and therefore could not form any visual perceptions or memories or associations. Therefore when an operation or the action of the radium rays suddenly enables them to see, they perceive at first only a confusion of colors or forms which they are absolutely unable to bring into relation with the things which they know perfectly well by taste or hearing. They must first see and then learn to associate the images of sight with those of other senses. But if their brain is normal they can do it.

B. Imbecility or Feeble-mindedness.

By feeble-mindedness we mean a lesser form of congenital mental weakness than idiocy. Here alterations of the cerebral substance are not usually demonstrable. Yet minor local lesions of the brain and insignificant visible destructions of substance may cause imbecility. Imbecility can affect all mental spheres, and different ones in very different degrees, according to its severity. It is not sharply distinguished from "normal" inborn stupidity and incapacity. It is of great social importance because it is often misjudged and misunderstood. The idiot is regarded by everybody as irresponsible and unsound,

and protected accordingly; but the slightly weak-minded only, as a rule, when he has visible frailties or when there is purely intellectual weakness. Yet a feeble-minded person need not necessarily be feeble-minded in every respect. He can be especially weak in some special sphere, and in this case the weakness is easily turned into a reproach. Often, and indeed for the most part, feeble-mindedness rests on a disease or defect of the germinal constitution, and thus belongs more to the following second group. Intellectual feeble-mindedness can be recognised especially by weakness of judgment, narrow horizon, and poverty of thought. Often gifted with good memory and normal powers of apprehension, the patient deceives both teacher and parent, and only betrays his weakness at the age at which people become independent, by his inability to conduct himself rationally and make his way in life. Then he makes nothing but blunders, and succumbs in the most childish way to the first crude temptations of Venus or Bacchus or Mammon. In spite of all the learning that he picked up he ruins himself and often his family by foolish undertakings and speculations in which he falls into the hands of sharks.

Imbecility of feeling manifests itself in apathy, indifference, and, most of all, in a failure of the higher ethical stirrings, especially of sympathy for others; and this is frequently united with extreme anti-social and brutally egoistic impulses. To this class of mainly or purely moral imbeciles (and still more to

the class of moral idiots) belong the born criminals and all sorts of human beasts of prey for whom society is nothing but a field to be exploited by their reckless selfishness. Equipped as he often is with the most refined cunning, the moral imbecile then knows how to drape himself virtuously in beautiful speeches and hypocritical acts and to conceal his selfish and criminal impulses under the mantle of feigned love for his neighbour. Indeed ethical depravity can often be associated with high intelligence; and this is the case with many of the great criminals and monsters of whom world-history tells. As a rule, however, moral imbecility populates the penitentiaries and the houses of correction and prostitution with " recidivists " or old-offenders, whose egoistic passions cannot be suppressed either through kindness or education or punishment, and therefore continually drive them to new crimes or at the least to new conflicts with society. Still more frequently imbecility of feeling manifests itself in a simple, outspoken tendency to malicious and perverse transactions and in a predominance of the vulgar passions.

In the field of æsthetics, imbecility manifests itself in a lack of every artistic sense. There are, for example, musical imbeciles who cannot tell a noise from a tone.

Imbecility of will appears mainly in the forms of abulia and impulsiveness, as in the case of idiocy.[1] It is often accompanied by a good, normal endowment of intellect and feeling; but neither the impul-

[1] See above.

sive sufferer nor the victim of abulia can turn these gifts to proper account. The latter is hindered by his sluggishness and phlegmatic disposition. The former lacks in persistence and consecutiveness of conduct, and puts his gifts wholly at the service of his rapidly changing moods and impulses, so that nothing is ever properly finished. In most cases imbecility manifests itself in several spheres together and supplies society with numberless inferior people. Still, many of these are only intellectually weak or apathetic, but otherwise good-natured and very available for mechanical farm-work and other manual services, because their will and industry are sufficient and their passions weak.

There is still another *developmental weakness*, which manifests itself as asthenia or irritable weakness, with all sorts of nervousness, a tendency to cramps, hyperæsthesia, mental distress ("anxiety"), abnormal precocity in certain spheres, and so forth, and which arrests children in their development. In such cases, the feeble-mindedness is often more functional than organic, though an abnormally irritable disposition of the central nervous system can be inherited. Here a sound upbringing can correct much. There are also real mental disturbances or psychoses of childhood which appear and subside in much the same way as with adults; but they always greatly endanger the subsequent mental development. Amongst these epilepsy, hysteria, and hypochondria are most important.

There are also constitutional weaknesses and dis-

eases which appear in the sphere of the subordinate brain centres and of the peripheral nerves and injure their functions and arrest development. These include certain failings of speech, great lack of skill for elementary bodily exercises and technical dexterities (though the seat of this is usually in the cerebrum), undeveloped gait or sensory functions—in short, all sorts of inferiorities and defects such as one notices in himself and his acquaintances, but which we cannot enumerate here.

Group II—Inherited Mental and Nervous Diseases

The diseases of this group, which can be designated as "*Constitutional Disturbances,*" often cannot be sharply distinguished from those of the previous group, especially imbecility, from which they are particularly hard to distinguish. Koch has called them "psychopathic inferiorities"; but amongst them there are also one-sided "superiorities." To avoid repetition, let us say at once that in the first place the group includes all forms of imbecility whose cause is not to be sought in diseases of the embryo or of childhood but in inherited abnormalities of the germ plasm. For the rest, it is practically impossible in every case of the sort to separate what is purely hereditary from what is acquired in the course of development; both groups of factors usually work together to engender a product as unfortunate for the individual himself as for society. What is abnormal

here is thus the original disposition. Through training and the relations of life this bad disposition can be strengthened, *i. e.*, made worse, or, if it is not too powerful and one-sided, it can be more or less successfully combated and dammed back. Let us look now at the most important of those pronouncedly pathological characters,—for with such we are concerned.

Pronounced imbecility in one of the principal spheres of psychology—intellect, feeling, or will—produces a corresponding pathological formation of character. As such we have already mentioned, in our discussion of imbecility, inherited weakness of judgment, intellectual weakness in general, moral and æsthetic feeble-mindedness, and abulia, as well as the impulsive and the asthenic weakness of will. In contrast to moral imbecility, there is a peculiar pathological disposition with an exaggerated development of conscience or altruism, and pathological conscientiousness and regard for others. There are people whose conscientiousness or feeling of duty is so exaggerated that in their continual painful efforts to fulfil their duties towards their neighbours they most sadly neglect their duties towards themselves; in order to do good to others they ill-use themselves bodily and mentally, allow themselves neither food nor rest, and often completely degrade themselves for the sake of others who only regard them as objects of exploitation and bring them to utter ruin. They are victims of their pathological altruism. Others degenerate into religious and moral fanatics, devote

health and means to an injudicious, exaggerated ideal, and at last go to grief mentally or financially. With such people unselfishness degenerates on occasion into crass intolerance, since they wish to extend to others the exaggerated strictness that they exercise toward themselves. So, through irony of fate, pathological altruism can be turned about into ethical perversion. In the case of many people who are falsely regarded as conscious hypocrites, self-mortification and pathological altruism are united with secret perversions or excesses of some special impulse, especially the sexual.

Désequilibrés (unbalanced) is a term used by the French to indicate those pathological natures who lack balance in this or that or in many respects, and whose thought and feeling and will are generally unsteady and without proper measure. The modern term *psychasthenia,* or mental irritable weakness, can also be used in the description of such cases.

Sexual Abnormalities. Only in the most rare and unimportant cases are these dependent upon disturbances of the sexual organs, especially of the glands. They are usually due to a more or less abnormal and strongly hereditary sexual disposition in the brain itself and to individual habits of sexual indulgence. To be sure, when infants are castrated, or deprived of their sexual glands, the development of sexual excitability in the brain is completely arrested, but never when the castration takes place after puberty. Eunuchs (castrated in infancy) develop a good deal

like women, with a high childish voice, no beard, and other such characteristics. Of abnormal inherited sexual tendencies there is a vast number, but the following are the principal kinds:

1. *Excessive* and *Premature Development* (with either sex). Corresponding to this there is a premature development, even with children from seven to nine years old, of predominating sexual ideas and corresponding impulses.

2. *The Lack, or Abnormally Slight Development, of Sexual Impulse.* When this impulse is totally lacking (in spite of completely normal glands and cells), sexual images are generally lacking also. With men this is very rare; but with women, who are naturally more passive in their sexual relations, it is very frequent and scarcely to be regarded as abnormal.

Sexual abnormalities include cases in which the impulse has an abnormal object. First amongst these is a sexual impulse towards others of the same sex, then an impulse towards every possible sort of fetish, women's skirts or pigtails, animals, or inanimate things, as well as all abnormalities in otherwise normally directed sexual impulses, such as a man wanting a woman to pound him, or wanting to hurt her, a mania for immature girls or for smutty talk.

Onanism or self-pollution is by no means always an abnormality, but for the most part only a makeshift bred of imitation and habit, for the satisfaction of sexual desire when normal means are not at

hand. But it can also rest, though this is rare, on an inherited perversion of instinct. All sexual abnormalities and weaknesses have a strong tendency to be increased through habit and repetition. Indeed they can often arise through example and misguidance or erotic stimulations. Strong sexual excitability brings endlessly more harm than the opposite defect. For this reason it is a principal rule of hygiene to suppress the sexual impulse as much as possible, or at least to exercise the greatest moderation in its satisfaction, and to devote one's self to more useful spheres of existence. We will not deny that in many cases disturbances of the lower nerve centres for the sexual organs play a part, but this is the exception.

Hypochondria rests on a strong inherited tendency to anxious, uneasy observation of one's self, especially of one's body. This produces a crowd of autosuggestions of symptoms of diseases which are really not present. The hypochondriac is always busying himself with his health, and so his brain engenders diseased products, such as pains, paræsthesias of all sorts, arrests of movement, and in short disturbances in the whole realm of nervous disease; and of course the hypochondriac believes that he suffers from every imaginable bodily disease, because he feels and undergoes the symptoms, exactly as though a real organic trouble were present.[1] Every attempt to treat the hypochondriacal symptoms medically

[1] See Chapter VI.—Nervous Disturbances.

strengthens them and makes them worse. Only one thing can help: distraction through pleasant, useful, interesting work. If the hypochondria is not too old and not too deeply constitutional, it can be improved in this way and sometimes cured. Unfortunately the hypochondriac is incessantly driven by his anxious uneasiness from one attempted cure to another, and thus becomes a voluntary milch-cow for all licensed and unlicensed swindlers. Hypochondria is the principal ingredient in the omnium-gatherum of diseases thrown together nowadays under the name *Neurasthenia.* It is an eminently hereditary disease, resting on a pathological disposition of the germinal constitution, although it often does not break out plainly until later years.

Insistent Ideas and Impulses. Certain ideas impress themselves continually on otherwise sensible people and often worry them until they are sick of life, such as the idea that one's spelling is wrong, or that hairs, which disgust him deeply, are sticking to his clothes. Or perhaps it is in the motor sphere, and then his ideas take the form of imperative impulses or forced acts, such as smashing things or boxing people's ears. If it is his feelings that are affected, especially feelings of anxiety, then we speak of *phobias* (such as fear of an empty room, fear of places, spiders, mice, etc.). For the more general, less morbid desires or dislikes of individuals with reference to particular things we use the term *idiosyncrasies.* I saw a girl whose life was a burden because

she could never see a doll without becoming so fearfully afraid that it would cry that she would run away as from the devil incarnate. The idiosyncrasy may consist merely of nausea or an unconscious nervous reaction (without anxiety).

Constitutional Abnormalities of Mood (*Verstimmungen*). Many people remain continually under the preponderating influence of a strongly-marked and exaggerated mood, which rests on a pathological disposition and is abnormal because it is for the most part without external occasion. The moods include sadness and melancholy, sensitiveness, hate, jealousy, suspicion, or, on the other side, good spirits and mirthfulness or heedless optimism. The morbid circumstance is that the moods are not at all fitted to the real state of affairs: a man is not normal if he laughs and does not trouble about anything in the midst of the deepest misfortune, or sighs distressfully or even weeps and grows desperate in the height of prosperity, or continually responds to friendly approaches with repellent suspicion or jealousy. When any one is constitutionally out of tune such reactions as these are a part of the general character, and for this very reason the character is abnormal. In other cases there is a mere supersensitiveness of feeling in all directions, or, on the contrary, an apathetic dulness, to which we have already referred. In still others there is a periodical, "circular" exchange of emotional condition, under the influence of which a person can appear cheerful, enterprising, optimistic,

and active for six months at a time, and in the next six months be obstructed, sad, and pessimistic. These pathological rotations of moods are commoner than we think. If the trouble becomes a regular mental disturbance, then it develops into what is known as *circular insanity* (melancholia alternating with mania). There are many other peculiarities of character which are widely spread and well known in human society but not abnormal when they are only moderately developed, though they become decidedly pathological when they have an exaggerated one-sided development. I name the spendthrift, the niggard, the fanatic, the visionary, the obstinate dogmatist and "kicker," the phlegmatic, the vagabond, the malicious old gossip, the schemer, the idle fop, and empty people in general. To enumerate all possible peculiarities would lengthen the list tenfold.

But the *pathological swindler* or *imaginative liar* deserves special mention. He lies best who deceives himself by confusing the products of his fancy with realities. He believes in his lies wholly or partly, permanently or temporarily, no less than the famous Tartarin of Tarascon in Alphonse Daudet's well-known story. False memories constantly disturb his reproductive faculty. Since he plunges with his whole attention, his whole ego, into the deceptive creations of his fancy in such a way that they become realities to him, this gives him such an assured appearance, and he presents his humbugs and swindles so ingenuously and naturally, with such an innocent

expression or with such unfeigned enthusiasm, that he succeeds again and again in convincing his fellowmen, where a conscious liar, who coolly and clearly measures his words, in constant fear of contradicting himself or being trapped, meets with instinctive mistrust. In the consciousness of the common or normal liar two trains of thought flow beside each other, the thought of the truth and the thought of the lie, and they trip each other up. In the brain of the imaginative liar all is unified, and so he can carry through the most magnificent swindles artistically and with inner conviction. Thus he drags a multitude of credulous souls with him to ruin. The public believes blindly in his alluring portrayals, his poetic effusions, until at last some chance or the reflection of a thoughtful man brings the end with panic, and usually a sensation in the courts.[1] Then, as though wakening from a dream, the pathological swindler collapses for the moment almost as astonished and dismayed as his victims—only to soon begin again, for he cannot help himself. His whole life long one *fata morgana,* one mirage, makes way for another.

Finally we must speak of *hysteria,* which has nothing to do with the uterus [as the derivation of the word implies] and everything to do with the brain. A woman or man is hysterical if his various thoughts,

[1] The celebrated Therèse Humbert who was tried in Paris for a swindle involving millions, to judge by all appearances and especially by her answers in the judicial examination, was in the main a pathological swindler.

which are normally balanced against each other, are very easily dissociated, so that the neurokym lying at the base of individual, dissociated ideas is in a condidition to increase powerfully and produce unusual inhibitions and nervous connections (*Bahnungen*). As a result of such dissociations it is possible for some overpowering feeling or idea to call forth various kinds of permanent paralyses, cramps, anæsthesias; hyperæsthesias, pains, and all sorts of other symptoms of disease, fits of rage, sexual abnormalities, inhibitions, or strong irritations, but also, on the other side, ingenious pieces of work, the healing of these very diseases, enthusiasm for the good, self-sacrifice, heroic deeds, and, in short, everything that the human brain can prevent or produce. Hysteria as a disposition of the brain is to some extent a two-edged sword. It engenders an untold amount of evil and many, misunderstandings, and yet delivers from many sufferings,—and is misunderstood by very many physicians. Hysterical persons, misled or otherwise badly moulded, can become devils; but if they are well-led or of noble nature, they are often angels or heroes, like the Maid of Orleans. Hysteria is almost a world in itself. Unfortunately it combines in many ways with all the other abnormalities which we have enumerated and becomes a sore calamity for those who surround the patients, even more, almost, than for the patients themselves. The hygiene of hysteria consists in making a rational use of their pathological dissociability or suggestibility for

good. But we must not misunderstand the nature of hysteria and apply the name to a host of mental disturbances which have nothing or very little to do with it.

We have seen already that no sharp line can be drawn between any constitutional mental and nervous abnormality and the normal. What is incurable in all alike is the constitutional tendency. Yet this is usually not too strong to be combated and dammed in, or weakened (strengthened in the case of deficiencies), or at least turned into less harmful paths by good contrary habits. Nay, now and then indeed, as with hysteria, these tendencies can be turned to great social uses. *Psychotherapeutics*, or suggestive therapeutics (the exertion of functional influences upon the brain life), here takes the place of nerve hygiene.

There are also constitutional inherited weaknesses or irritabilities in the sense-organs, in the spinal cord, and elsewhere, such as weakness of vision and other abnormalities of the eye, irritable conditions of the spinal cord (spinal irritability with muscular quivers), constitutional reflex disturbances, such as "tics," or nystagmus; but in all of these a certain abnormality of brain-function generally plays a part.

Group III.—Acquired Mental and Nervous Diseases

In so far as the diseases of this group are not caused exclusively by wounds, poisoning, bacterial infection, or shrinking, of the nerves, they develop, as a

rule, on hereditary soil, and so are related to the foregoing groups and bound up with them in many ways. The main difference is that the pathological conditions mentioned in the second group concern the inherited disposition itself, while the conditions which we are now to discuss have an acute origin in the life of the individual, whether this be from external injuries or from some action of the brain itself, due to its abnormal inherited tendencies. In the latter case, the action of a sickly brain slowly prepares the catastrophe, which is then called a *neurokym storm.*

In the present state of our knowledge it is not always possible to make a sharper or more thoroughgoing distinction than this between the functional and the organic.

A. Epilepsy. Epilepsy, or the falling sickness, is well known, unusually dependent on hereditary tendencies, and very common in youth; for which reasons it is very nearly related to the two preceding groups. Besides the common falling fits with sudden loss of consciousness and clonic cramps, the disease also develops mental disturbances which are often of long duration and may amount to raving madness, though the patients usually have little or no recollection (amnesia) of them. By "masked epilepsy" (*épilepsie larvée*) we mean attacks of vertigo which last a few seconds without convulsions and without falling. When epilepsy appears in youth it usually arrests the mental development and leads to stupefaction and moral defect.

With old cases we find a hardening of the external layer of the brain cortex, though it is not clear whether this is the cause of the disease or the result. But there are certain forms of epilepsy which are caused by inflammation in the centres or by injuries to the brain. The use of alcohol strengthens epilepsy and promotes the attacks; it may also lead to the disease.

B. Functional Psychoses. The term Maniacal Depressive Insanity (*manisch-depressives Irresein*, Kraepelin) is used to include both mania, or acute attacks of emotional excitement (*Willensaufregung*) accompanied by a mad rush of ideas (*Gedankenflucht*) and excessive happiness, and melancholia where all the functions are obstructed and the patient suffers extreme sadness and perhaps "anxiety." The attacks of mania and melancholia are curable, but have a great tendency to repeat themselves or to become periodic.

Paranoia (*Verrücktheit*) is almost always incurable. It is a delusion of persecution worked out with great consistency and accompanied by delusions of grandeur and a progressive ethical deficiency, though the mind remains relatively clear. Paranoiacs are at the same time dangerous and capable of work, and pass with the laity as mentally sound because their conduct is orderly and they often conceal their delusions. *Querulants* are paranoiacs whose delusions of ill-treatment retain the character of the possible and are accompanied by a diseased mania

for getting one's rights through the law courts, so that the patient spends his life in endless lawsuits. Often the delusion originates from some unimportant injustice which he actually suffered. Congenital paranoiacs are persons who showed more or less tendency to delusions of persecution and grandeur even in childhood. These can also be arranged in our second group and amongst them it is especially true that there is every grade of transition to the normal.

Acquired Dementia-Processes (*Verblödungsprozesse,* Kraepelin). There are a large number of acquired mental diseases which begin at first with serious symptoms (such as hallucinations, delusions, false memories, associational disturbances, catalepsy), accompanied or unaccompanied with depression or elevation of spirits, and after a more or less prolonged course go over into incurable and usually very deep dementia. Such cases fill the lunatic asylums. Kahlbaum, Hecker, and Kraepelin have applied to them the names *Hebephrenia* (a rapid dementia with people still quite young), *Catatonia* (involving catalepsy and "perturbation," *i. e.*, an abnormal restlessness and confusion), *Dementia Præcox* (an early dementia), *Dementia Paranoides* (the same dementia following paranoia); and have very properly distinguished them from mania, melancholia, and paranoia (*Verrücktheit*). Yet there are cases amongst them which are cured (especially with catatonia), as well as transitional conditions to the forms just mentioned.

Functional Neuroses. There are a set of painful diseases and motor disturbances of a functional sort, without mental disturbance and yet frequently dependent upon the cerebrum. Such are migraine and many other headaches, also other neuralgias, and pains such as sciatica, lumbago, and akinesia algera (painful cramp). Many of these can be called pseudo-rheumatism. In the motor field we can name nystagmus, writing cramps, speech cramps (stuttering), St. Vitus's dance, athetosa (a definite sort of trembling, which, however, usually or at least very often flows from organic disturbances of the brain), tetanus (attacks of tonic muscular cramps), apraxia, astasia, abasia, etc. The number of functional nervous disturbances in the realm of feeling (of pain) and of movement is very great. For the most part they rest more or less on irritations or stimulations of the cerebrum and can be removed again by similar causes (through suggestion) but by no means always, and it is often very difficult to find out where the harmful stimulus originates. This may be in conditions on the surface of the body. Thus there are migraines which are caused by an anomaly in the shape of the cornea (astigmatism), because the disturbance of sight overtaxes the sensory and motor nerves of the eye and causes unhealthy reactions. On the other hand, the same or quite similar nervous disturbances can be called out entirely from the brain by strong emotional impressions such as fright or by autosuggestion. In this way mental

disturbances of the more general sort set up reflex localised disturbances and, on the other hand, though much more rarely, can be set up by them.

C. Poisonings of the Nervous System. Nutritive materials include all substances which when taken into the body enter into chemical combinations with the protoplasm and serve to build it up or to preserve its vital functions. It was formerly laid down as a dogma that a part of the nutritive material is simply burned up in the body as a generator of force without becoming a real constituent part of the living protoplasm even for a short period. But this dogma continually shows itself more and more false, for the products of protoplasmic decomposition and the use of nutritive material for its repair can be demonstrated everywhere, though we cannot demonstrate anywhere a mere combustion without a previous use as cell material (Kassowitz). Now when a nutritive material is turned into the living protoplasm it must not injure it. If it does it is a poison.

There are poisons which come from without and, as modern investigations have shown, poisons or toxins which are formed in the body itself through the accumulation of catabolic products. Yet all we know about the chemistry of the animal tissue is based upon the chemical combinations that are found in dead bodies, and in the catabolic products (excreta) of life. The chemistry of life itself is still an absolute riddle for whose solution we possess only doubtful hypotheses. Consequently the only ap-

propriate definition of what can be called nutritive material is purely practical:

Nutritive materials (or foods) are all substances which have shown themselves to be fitted by a long phylogenetic process of adaptation for the building up of the human body and the support of its functions, and by the use of which experience shows that the body flourishes without any symptoms of poisoning. To these belong water, most albuminous bodies, starchy meals, fats, sugar, and vegetable salts, as contained in fruits, vegetables, roots, cereals, and in animal foods. The statement that a poison can be at the same time a food is a mere playing with words. To be sure, many poisons dissolved in the body can form fat and produce some phenomena similar to the effects of foods; yet as soon as they produce a temporary or permanent injury in the vital functions or the anatomical constitution of the protoplasm they can be called foods no longer. On the other side also, many of the best foods, when eaten to excess so as to over-feed the tissues, can form toxins and thus act as poisons indirectly; but that is a different matter and can be avoided by moderation in eating and by reasonable exercise. Certain chemical substances have a poisonous effect with some animals but not with others. With these, perhaps, we may think of the possibility of a gradual accommodation, but never with those substances which, like alcohol, act as a protoplasmic poison with all living organisms everywhere. What now has experience shown

to be the principal poisons for the nervous system?

There are two sorts of poisons: (1) Those which are easily dissolved or decomposed and thus soon disappear from the system. Yet if these poisons are frequently repeated they can leave lasting disturbances behind them. Thus when they are taken for the first time they cause acute poisoning (*i. e.*, sudden, more or less severe, but temporary); but when they are regularly repeated the poisoning is chronic, *i. e.*, permanent and slowly progressive, conditioned by an accumulation of lasting reflex effects. (2) Poisons hard to dissolve or decompose, mostly metals, whose effect is slowly progressive from the beginning and very chronic.

(1) *Poisons easily soluble.* These include a large number of more or less rare poisons, like coal gas or poisonous mushrooms, which are usually taken into the system by accident or mistake and generally act upon the nervous system by paralysing or stimulating its functions, more rarely by decomposing its material. They act once for all. Such poisons are also used for murderous or suicidal ends. The result is either death or a cure; they seldom leave a lasting effect behind them; yet often there are mental disturbances (usually incoherence) and paralyses which last for weeks. Such poisons are relatively unimportant, because people are very much afraid of them and avoid them.

Tremendously important, on the contrary, is the

whole class of *narcotic* poisons, especially those amongst them whose habitual use has unfortunately become or threatens to become a custom. The worst of these are alcohol, opium, morphia, ether, cocain, and Indian hemp. At first they all cause a pleasant acute poisoning of the brain, which dulls or inhibits strong, painful sensations, gives the illusion of happiness or good fortune, in its first period often causes a certain excitation in the motor field, agreeably titillates lower impulses and feelings, but at the same time injures the associations, the judgment and discretion, consistent willing, and the finer ethical and æsthetic feelings. Moreover all these poisons in common have the property of engendering an appetite or pathological desire, of different strength with different people, for repeated poisoning and larger doses. In this way their use is spread in society and their effects on individuals are strengthened. They lead to regular poisoning epidemics. At the same time their repeated use produces a slow degeneration of the central nervous system and often of other tissues too, and a slow protracted sickliness, though to be sure these effects develop so slowly when the doses are small and can proceed with such slight visible disturbances that society gets accustomed to it and does not notice the inferiority which it produces. Yet with stronger doses the chronic poisoning leads to deep changes of character, amounting sometimes to complete mental alienation or even dementia. The chronic use of narcotics (such as alcohol, morphium,

or opium) makes people more or less cowardly, brutal, and ethically defective according to the nature of the poison; while the acute poisoning (the drunken fit) is like a temporary insanity. Yet the worst of all is the fact that acute and chronic poisoning from alcohol in particular, assuredly affects the reproductive glands and makes the germs there degenerate, so that the next generation is more or less crippled according to the extent of the social poisoning (see further below). A large part of the diseases and abnormalities of the nervous system already enumerated in the first, second, and third groups is undoubtedly the indirect product of chronic narcotic germ poisoning on the part of previous generations. This is true to the highest degree with idiocy and epilepsy, but true also with the hereditary psychoses and neuroses. By far the most important rôle in the poisoning of the civilised world is played by alcohol (in China by opium). Acute alcoholic poisoning is intoxication; the chronic poisoning, chronic alcoholism. Delirium tremens is a mental disturbance which often results from chronic alcoholism. But there are also alcoholic epilepsy, alcoholic nervous paralysis, neuralgias, shrinking of the optic nerve, melancholias, manias, delirium, and even shrinking of the brain accompanied by dementia. There has also been observed a serious mental disturbance (Korsakow's psychosis) which arises from so-called polyneuritis, *i. e.*, from repeated nervous inflammations almost always caused by alcohol. More

than half the crimes are performed under the influence of alcoholic poisoning, especially indecent assaults. Alcoholic poisoning very often causes abnormalities in the sexual impulse. In the fifteen largest cities of Switzerland, a third of the suicides amongst males and a tenth of the fatal accidents to males over twenty years old are due to alcohol. From about twenty to thirty-five per cent. of the male patients admitted into the Swiss lunatic asylums have been directly affected mentally by alcohol. It is the same ethyl-alcohol which is particularly poisonous in brandy, wine, beer, and cider, and brings about the phenomena of social pathology which we have depicted. With us up to the present time people have not known much better than to preach moderation and practise more or less immoderation, instead of combating the use of this social poison. People are unfortunately blinded when they give themselves up to a narcotic; they persist in self-deception and the general degeneration remains for the most part unnoticed because individuals only begin to notice it in their own case when it has already gained considerable ground. Then, again, there is a peculiar reciprocal action between constitutional psychopathy (the hereditary tendency to mental and nervous disturbances) and alcoholism: through inheritance the former is to a large extent engendered from the latter, but at the same time the psychopath tends to drink and usually succumbs most rapidly to alcoholism. Then because these very psychopaths are the

worst to stand alcohol people think that excessive drinking is only the vice of a few weaklings!

The following figures show best the rôle played by alcohol in diseases of the nervous system. From 1870 to 1900, 7720 patients were admitted into the Burghölzli Insane Asylum at Zurich, including 972 cases of poisoning of the nervous system. With 925 of these latter cases (95.2 per cent., or 12 per cent. of all admitted) it was a matter of alcoholic poisoning; in 38 cases (3.9 per cent.), of morphia poisoning. There were three cases of lead poisoning, and one each of poisoning by potassium bromide, cocain, chloral, ether, carbonic oxide, and illuminating gas. Of tobacco, tea, and coffee poisoning, about which there is so much twaddle, there was not a single case observed. In 1900, according to the federal statistics, 1424 men were admitted into the Swiss lunatic asylums. Of these 294 (20 per cent.) were direct alcoholic cases, and there were only nine cases of other mental poisoning, mostly from morphia. But we see the true significance of these figures only when we think that of the remaining patients a large number, hard to ascertain exactly, have also alcoholism (on the part of their ancestors if not on their own) to thank for the origin of their disease, and that many other causes of mental disturbance, such as syphilis, were most frequently acquired in a state of alcoholic intoxication. When chronic users of narcotics are deprived of their poison they suffer at first (especially the morphine fiends, but the others also) from

severe "abstinence symptoms," and yet the complete suppression of the poison offers the only possibility of their cure. After the abstinence symptoms have been lived through, health and normal powers return so far as permanent injuries are not present. He who has an appetite for one narcotic can usually succumb easily to others also, and should be careful to avoid them all.

(2) *Poisons which are hard to dissolve, and remain in the system.* Lead in particular (with painters) causes chronic poisonings of the brain and spinal cord and also of the periphal nerves, which produce shrinkings of the nervous tissue with corresponding paralyses or cripplings and often with mental disturbances. Such cases, however, are rare. Still rarer are poisonings with silver and quicksilver. These poisons engender no appetite.

D. Infections of the Nervous System. Bacteria and other small organisms produce many serious diseases, as everybody knows, and from them the nervous system can also suffer. Serious mental disturbances are found after typhoid fever, in consequence of an invasion of the brain by the typhoid bacteria; and the same is the case after such other germ diseases as influenza, malaria, yellow fever, smallpox, and cholera. Yet the worst of all infections for the central nervous system is syphilis. This can lead at once to all sorts of new formations, inflammations, destructions of tissue, and shrinkings in the brain, spinal cord, and nerves, which for their part give occasion for nervous

disturbances, such as paralyses, cramps, convulsions, or pains. Moreover, the dreaded locomotor ataxy, or spinal sclerosis (*tabes dorsalis*), can develop with special severity on a soil rendered sickly by syphilis, and as a consequence of it, often from five to twenty years after its apparent cure;—and the same is true of the still more fearful progressive paralysis of the brain (falsely known as softening of the brain). Both appear only with syphilitics, but appear to be secondary shrinking processes rather than direct products of the syphilis. With the second of these diseases, the brain shrinks to such an extent that all the functions of nerve and mind fall into progressive organic disintegration, and the patients well afford the most wretched conceivable picture of human decay. It is peculiar that with races who abstain from alcohol (the Mohammedans) syphilis almost never leads to brain paralysis, and, on the other hand, does so all the more frequently when alcoholism is also present. This disease affords the best examples of all-around organic dissociations in thought, feeling, will, and movement.

Leprosy leads especially to swellings of the peripheral nerves, and when it attacks the ganglia it also produces local anæsthesias and paralyses. In Italy the exclusive use of spoiled Indian corn often leads to pellagra, a serious mental disturbance with bodily sickliness. In tropical countries there is a set of still other infections in which the nervous system is involved.

E. Insanity and Nervous Diseases with Various Localised Diseases. Every circumscribed organic disease of the tissue of the brain, spinal cord, or peripheral nerves at first produces local symptoms, which depend upon the disturbance or destruction of the locality in question. See the localisations in the brain as shown in Chapters II. and IV. and Figures 9 and 10. A destruction of the centre CC (Fig. 9) on the left side will lead, for example, to a paralysis of voluntary movements in the right foot; the destruction of the right anterior horn of the lumbar region of the spinal cord will kill the neurones of the right foot and cause a shrivelling up of the muscle, while a leprous nodule in a sensory nerve will kill it and cause insensibility for stimuli in the region of the skin cared for by it.

In heart disease, when some coagulated blood from the heart runs into a brain artery and stops it up (this is called embolism), the part of the brain supplied by this artery is shut out from the circulation of the blood and dies. This results in a softening of the region affected, with corresponding losses of speech or other symptoms, according to the locality. Something similar takes place with bleedings in the brain in consequence of diseased blood-vessels (apoplexy), with brain tumours, and with every sort of shrinking process in different nerve regions; and thus there arise a number of diseases such as abscess in the brain, multiple sclerosis, or myelitis, with corresponding symptoms, mostly chronic. If a considerable

part of the brain is destroyed then of course the mental faculties suffer. Very often, too, tensions and pressures exerted from the seat of the disease upon surrounding parts of the brain lead to general symptoms of irritation or to the suppression of functions, and cause general mental disturbances, convulsions, paralyses, pains, unconsciousness, disturbances of speech, and other grave symptoms. It is impossible here to go into the detail of this enormously complicated subject. As an example of a peripheral local nervous affection we need only mention the peculiar blister-like eruption of zoster, which rests on the inflammation of a nerve and causes neuralgic pains. It is clear, again, that localised troubles have their separate causes. Tumours, for example, undoubtedly depend on infections through lower organisms, which however, have not yet been positively demonstrated, and abscesses in the brain are sometimes caused by tubercular bacilli. Other troubles are caused by wounds (such as a broken skull, crushed nerves, or direct laceration of the brain by a sudden jar).

F. General Metabolic Diseases. Certain mental disturbances can be caused by general metabolic diseases, such as gout (uric acid poisoning) and uræmia (poisoning by urea); or by glandular diseases, such as diabetes, or myxœdema (see cretinism above). And there are other more or less rare metabolic diseases, which also affect the mind.[1]

[1] See Dennig, *Hygiene des Stoffwechsels*, Moritz, pub., Stuttgart.

G. Exhaustion. Acute inanition, a lasting condition of hunger, or any other exhaustion of the nervous system can produce acute deliriums and the mental disturbances grouped under the name *asthenia.* We may consider this the true "neurasthenia," which can also arise in certain cases in consequence of great mental overwork, especially when associated with scanty sleep. It is not rare for it to show symptoms similar to those of hysteria; and it often produces mental disturbances with complete incoherence, or perhaps extreme irritable weakness with many hyperæsthesias and symptoms like those of hypochondria. But all these disturbances are more curable when they result from exhaustion than those already discussed in the second group that arise merely through hereditary constitution. Indeed the significance of acquired neurasthenia or psychasthenia has been ridiculously exaggerated. With sound natures they are extremely rare. But people are prone to attach far too much importance to exhaustion or rather external causes, which are usually only the drop that makes the glass overflow, and to underestimate the inner force of the inherited predisposition. Yet we must admit that many who have inherited predispositions can protect themselves from the disturbances that threaten them by great prudence and a healthy mode of life, and with such people it is necessary to give great attention to the factor of exhaustion. We shall return to this in the chapter on hygiene.

Group IV.—Mental and Nervous Disturbances through Involution

As mental and nervous functions are built up in youthful development, so they crumble in the period of senile decay. Shrinking and degeneration in the walls of the blood-vessels are the usual causes of the shrinkings that take place in the neurones of older brains. If these are somewhat diffuse, the result is common senile dementia with weakness of memory and organic dissociations. This is often accompanied at first with mental dejection, but often too with excitement and buoyancy. Hostile egoism, stubborn obstinacy, and often brutality are further accompaniments. Another common and characteristic symptom is the excitement or perversion of the sexual impulse, as a result of which greybeards may make assaults on children or suddenly fall in love with young girls. If they die soon afterwards their sexual excesses and so-called "vices" are held to be the cause; while really the whole history and the death too were the result of the shrinking in the brain. In this way, many good and virtuous people have lost their reputation in their old age. Age, however, is not alone responsible for senile shrinking of the brain. Alcoholic poisoning and certain inherited predispositions often tend to produce a very premature senile involution of the brain. This can be observed in the fiftieth and very often in the sixtieth years; while very healthy people who abstain from alcohol or use

it very sparingly can often remain mentally clear to the ninetieth and even the hundredth year.

In old age the tendency to shrink is also present in the peripheral nerves such as the optic and auditory, and in the subordinate nerve centres. Indeed it is to be expected in all the bodily organs.

CHAPTER VIII

CAUSES OF MENTAL AND NERVOUS DISTURBANCES

A.—Inheritance

IN the past there has been much idle talk on this head, and it must at last be admitted that we know precious little about it; though the subject is not so obscure as it used to be. Doubtless we can say that in most cases of mental disturbance many causes co-operate and that if we examine individual cases we shall find that the most important of these causes is usually an inherited tendency. That is true at least of those disturbances which are not directly caused by wounds, bacterial infection, or poisoning. But what people have forgotten far too often in the past is to ask: Where does the inherited tendency come from? Why do people come into the world with a strong tendency to mental and nervous diseases? The answer, " Because their parents or ancestors were mentally diseased," is not satisfactory, for where did these get their disease or tendency to it? The sickly tendency must be introduced somewhere, and so the question comes back to the following: What causes produce or maintain in a given race or a given generation the tendency to engender mental and nervous

disturbances in their descendants? Since only that can be inherited which affects or injures the germ plasm itself (see Chapter V.), purely acquired local diseases of the nervous system as such can produce no pathological tendency in the germ. Moreover, since under normal conditions of life inherited pathological tendencies gradually tend to disappear in the course of a few generations through what is called regeneration, a progressive degeneration must have causes which are progressive or at least continually renewed, and cannot rest altogether on old inherited tendencies.

Inheritance has been studied especially in lunatic asylums; and according to different statistics we find an inheritable taint amongst parents and near relatives in forty per cent. to eighty per cent. of the cases. Yet these statistics usually rest upon such inaccurate and insecure statements that we cannot base much upon them. I got Miss J. Koller in her doctor's dissertation to make an exact comparison between the ancestors of four hundred persons who were mentally afflicted and the same number of normal persons; and she found that with the normal persons also there was a strong hereditary taint, especially in the form of nervous and mental disturbances in the collateral branches. Apoplexies, senile dementia, and organic lesions in the brain were as numerous amongst the ancestors of the normal as of the mentally diseased. On the other hand, the mentally affected showed a strong preponderance of idiocy, shocking characters, mental disturbance, and alcoholism in their direct

progenitors, *i. e.*, their immediate parents. Yet if we remember what has been said above, alcohol is the only cause which can be proved by statistics to give a direct new taint of mental disturbance to germs that were previously healthy. There certainly are other causes; but they are not numerous or clear enough to show themselves in figures.

But it is certainly bad enough if the parent merely passes over to his children abnormal tendencies which were already present in his ancestors. Those abnormalities which appear very early, like idiocy or epilepsy, are, as a rule, the expression of a deep hereditary degeneration of the germinal outfit (*Anlage*) of the nervous system; the same is true of the psychopathies and of the abnormal characters of our second group. The figures show also that these are found most frequently amongst the parents of the mentally diseased. The simple lesson to be drawn from these facts is that persons who are strongly abnormal as to mind and nerves and those who are especially inferior should have no children. Acquired mental diseases do not leave such a strong hereditary taint, yet they rest for the most part on a general tendency to mental disturbances; they often relapse, and usually injure family life so seriously, that it is a good rule for any one who has had pronounced mental disease to have no children, except in special cases.

It is not always understood how a queer-headed fellow can come from apparently healthy parents and

ancestors, without alcoholism or something of the sort being present. The point deserves explaining, for such cases belong to inheritance quite as much as those in which it is plainly recognisable. The fact that a dozen children of the same parents tend to deviate extraordinarily from each other when the parents represent different stocks, and especially when there has been marked cross-breeding for several generations, shows the lack of uniformity in the supply of germ-cells possessed by both men and women. Some of these contain more peculiarities, more atoms, of this or that ancestor than others. Thus an individual's peculiarities depend very largely upon the constitution of the two germ cells (male and female) which happen to unite for his conception. Now it can happen that an unfortunate combination adds together two weak ancestral peculiarities in such a way as to result in an inferiority or a regular abnormality, just as a very worthy descendant may arise from rather ordinary or even defective forebears by a happy summation of their good qualities. This fact can certainly not be upset. We must even give full credence to the doctrine that single bodily organs and the individual peculiarities to which they contribute are developed from very heterogeneous and dissimilar mixtures of the germinal molecules and the reproductive powers of different ancestors; for example, one can unite the nose of his paternal great-grandfather and the imagination of his maternal grandmother. But it would be a great mistake to deduce from this

a kind of metaphysical dogma that everything can be reduced to accident or fate. The more pathological and inferior components there are in the vital forces of ancestors and parents, the greater is the chance of having defective, abnormal, and mentally diseased children. And, on the other hand, the more ancestors and parents are composed of normal or generally superior people, the more capable will be the descendants they produce. Inheritance is thus a matter of per cents and probabilities. Individual cases prove little or nothing. It is a matter of approximation, and we can only say that the descendants of normal and capable progenitors will themselves be normal and capable in the greater number of cases, so long as they do not poison themselves and injure their germ cells; and that the descendants of those with distinctly inferior and pathological brains will be more often inferior and pathological. Only in the course of many generations can a very healthy and normal mode of life gradually improve the quality of such a bad breed.

It is not difficult to see how grievously our present marriages and methods of bringing up children sin against this natural law of inheritance, and what wretched human qualities attain to the greatest increase. Not that we should aim at the generation of resounding talent; but we should try at least to further the production of tolerably serviceable, healthy, ethically good, industrious people possessed of mental balance. In his *Histoire de la Science et des Savants,* Alphonse de Candolle has clearly demon-

strated by facts how mental and scientific gifts are inherited and how false it is to assert the opposite.[1] Our selection is miserable and engenders extremely pathological and inferior people. Of this more anon.

Every influence through which the germ is poisoned or otherwise injured, and which thus lays the foundation for inherited weakness in a healthy stock, can be called a germ-corruption (*blastophthoria*), and the manner in which it makes itself felt in the immediate descendants can be called extrinsic or improper inheritance; improper because in it the qualities already present in the ancestors are not handed over to the descendants, but new inferior or pathological qualities proceed from the deteriorated germ-cells, and then propagate themselves in further generations by common, "proper" inheritance. Blastophthoria is thus the worse form of inheritance, because it continually gives new impetus to the progressive degeneration of the species. Moreover it engenders not only diseases of the nervous system, but weaknesses of all the bodily organs.[2] The great type of such "improper" hereditary causes of mental disturbances is afforded by alcohol poisoning of the germ, and there is plenty of concrete evidence for its existence:

1. The statistics of a number of life-insurance companies in England, Scotland, and Australia which

[1] The same conclusions have been reached by Galton, Pearson, Woods, and Thorndike. See, for example, Galton's *Hereditary Genius* (Macmillan, pub.,) and Thorndike's *Measurements of Twins* (Science Press, pub., N. Y.)—TR.

[2] See Chapter V.—Race History.

insure total abstainers and moderate drinkers in separate classes and reject the intemperate altogether show right through a considerably larger average duration of life for the abstainers (about seventy per cent. of the expected deaths as against ninety to ninety-five per cent. with the non-abstainers).

2. From about one-half to three-quarters of the idiots and epileptics can be shown to spring from alcoholic parents or at least fathers. For the comparative statistics of Dr. Jenny Koller see above.

3. The animal experiments of Hodge, Lombemelle, and Laitinen show that amongst the progeny of animals that have been artificially alcoholised [by continually mixing considerable alcohol into their food] there are a large number that are stillborn or have water on the brain or rickets or are maimed and stunted in some other way and not fit to live.

4. Similar evidence has been adduced by Demme in Berne and others regarding the descendants of drinking families.

Professor Demme studied the children of ten large families in which the father and perhaps some of the other forebears were drinkers, and of ten others in which the parents and other ancestors were not abstainers to be sure, but yet lived soberly.

The first group (drinkers) had 57 children, of whom 12 died of weakness soon after birth. Of 36 others, 8 suffered from idiocy, 13 from convulsions and epilepsy, 2 were deaf and dumb, 5 suffered from inebriety with epilepsy or chorea, 3 from bodily de-

formities, and 5 were dwarfed. Only nine developed normal minds and bodies. Of seven of these nine the father alone had been given to drink, the mother and the paternal forefathers being temperate; while of the thirty-six children whose paternal forefathers or whose mother was also given to drink, only two remained normal.

The second (temperate) group had 61 children. Of these, 3 died of weakness and 2 of stomach and bowel catarrh shortly after birth; 2 more had St. Vitus's dance, and 2 were bodily deformed; 2 others remained backward mentally, yet without being idiots; 50 developed quite normally.

To this it must be added that the ten drinking men's families were not strikingly tainted with hereditary mental disease, though in one of them two of the father's brothers and sisters were epileptic and one was visionary, and in a second a brother of the father was deranged. In a third, the mother committed suicide in consequence of the father's drunkenness.

5. On the strength of the last Swiss census, which showed nine thousand idiots for the whole country, Dr. Bezzola has shown that there are two maximal periods in which they are begotten—the time of the vintage and the time of the carnival [before Lent, a period of great revelry], while the maximal period for the remaining, normal population is in summer. In the wine cantons, the time of vintage shows a very great maximum in the generation of idiots.

6. Von Bunge in Basel (Bâle) has proved statistically that the increasing incapacity of women to suckle their children rests pre-eminently upon the use of alcohol by their parents and forefathers. By similar statistics he has shown that alcoholism in the forefathers has a strong tendency to produce mental disturbances and the disposition to tuberculosis and dental decay.

7. H. E. Ziegler and H. Fühner have recently shown that even less than one per cent. of ethyl alcohol in the water retards the development of the embryo of the sea-urchin, that two per cent. produces monstrosities and great arrests of development, and that four per cent. hinders all development of the embryo.

8. Finally, post-mortem examination will show to any physician who will open his eyes the deleterious effect of alcohol on the bodily tissue, just as his practice will show its degenerative influence. To this I add that in Norway and Sweden, which were most seriously given over to alcohol and degenerated in the first half of the nineteenth century, the strict reform which took place about fifty years ago has resulted not only in preventing an increase in the number of mental disturbances and a diminution of crimes, but also in an important increase in the number of young men capable of military service, though only lately; while in central Europe the opposite conditions have produced opposite results. In like contrast to the Swedes, formerly healthy primitive

races began to degenerate when Europeans had taught them to drink,—such as many Indian races, Negroes, and Malays.

But other kinds of poisoning can also cause degeneration of the germ cells, such as those that result from other narcotics, syphilis, and tuberculosis; though this last does not injure the germs of the nervous system so much. Then, too, a very deteriorative effect is produced by factory life, by being shut up in bad air, by scanty nutrition, and by all one-sided or insufficient activities. Here, to be sure, there are no unambiguous figures as to the effects upon the nervous system as such; but it always degenerates with the other organs, just as the other bodily tissues degenerate with the nervous system in the case of alcoholic poisoning.

In connection with the inheritance of mental abnormalities we must speak briefly of the tendency to crime already mentioned in Chapter VII. in connection with imbecility. The celebrated "born criminal" of the Italian Lombroso is no other than the *ethical imbecile* in his different varieties. But the majority of our criminals have more or less hereditary tendency in that direction—something that the law still unfortunately ignores for the most part in practice. The prevention of reproduction amongst natural criminals and total abstinence from alcohol would do more for society and the prevention of crime than all the laws. This also belongs to hygiene; but the subject would lead us too far afield and so I urgently

recommend every one, especially physicians and jurists, to read the excellent little book of Delbrück on *Juridical Psychopathology.*[1]

B.—General Predisposing Elements in the Life of the Individual.

Age and sex bring with them the tendency to definite mental disturbances. Childhood inclines, as we saw, to developmental psychoses and neuroses, (first group of Chapter VII.) as well as to epilepsy. Advanced age tends to the psychoses and neuroses of the fourth group, while vigorous middle life is pre-eminently disposed to those of Group III. In the life of a woman there are certain periods of special weakness which have a bad effect on slumbering inherited tendencies and readily occasion the outbreak of acute psychoses. These are child-bed most of all, then the climacteric (the age when menstruation ceases), menstruation itself, and pregnancy. Many mental disturbances always get worse or return regularly at the period of menstruation. Most attacks of sickness caused in this way with women are acute and curable, though the outlook is often not so hopeful with the mental disturbances of the climacteric.

C. Acquired Causes.

1. *Purely Bodily Material Causes.* These include:

[1] *Gerichtliche Psycho-pathologie*, Joh. Ambrosius Barth, pub., Leipzig, 1897.

(*a*) *All poisonings.*[1] In this group the form of sickness is directly determined by its cause. Here of course we do not speak of those mental and nervous disturbances which have arisen indirectly through the inheritance of an ancestor's poisoned germ cells, but of direct poisoning of the nervous system, especially through such drugs as alcohol or morphia as well as by auto-intoxication. As we have seen, this group is very important.

(*b*) *Infections through lower organisms.* Infections through syphilis, typhoid, cholera, influenza, rabies, septic bacteria (blood poisoning), and tuberculosis (tubercular bacilli often cause inflammations in the brain and its coverings) can all attack the brain and the rest of the nervous system, and thus produce mental and nervous diseases which are often fatal or chronic and incurable, but also often curable. These we have already enumerated. The most important of them is the progressive paralysis caused by syphilis.

(*c*) *Metabolic diseases.* Gout, myxœdema (cretinism), and other general metabolic diseases can be the direct causes of mental disturbances.

(*d*) *Abnormal modes of life,* continuous confinement in bad air, unhealthy occupations, bad dwellings, faulty nutrition, and everything in general that reduces a person's general health and disturbs digestion and nourishment, also makes the brain less capable of resistance and indirectly causes the outbreak

[1] See Chapter VII., Group III, *C.*

of nervous and mental diseases. Yet here again those who usually succumb in this way are already handicapped nervously by heredity; with other people who contract general bodily diseases the results are more likely to be purely physical. The psychoses of exhaustion (see Chapter VII.) can be included here.

(*e*) Obviously all direct wounds and local organic diseases of the brain, jars, lacerations, tumours, apoplexies, and the like belong with the immediate causes of acquired mental disturbances. But the wounds have no hereditary effects whatever; they do not injure the germ cells or the descendants of the patient, and are not conditioned by inheritance from the ancestors.

Special mention must be given to certain disturbances whose course is similar to that of hysteria or brain paralysis, though they are the direct result of severe bodily injuries, and occur with special frequency in the case of railroad accidents. With these so-called *traumatic neuroses* and *psychoses* the question of damages from accident insurance plays a great part and really may influence their course. And yet the course of such afflictions is often very serious and the patients have not seldom been unjustly accused of shamming. There is no doubt that simple neuroses are often accompanied by simulation or exaggeration for the sake of getting higher damages; but it is much commoner for the cases to be made worse by autosuggestion. Such

cases can arise without wounds or bleeding in the brain.

2. *Purely Psychic or Mental Causes.* As we have already shown in Chapter III., nothing is really purely mental. What we understand by psychic diseases are irritations which arouse functional neurokym storms in the brain, because they liberate strong or lasting emotions either directly or through verbal and other associations. I say emotions, because pure excitements of will or intellect are rarely or never the cause of mental or nervous disturbances. Here the life of feeling or emotion plays the leading part. The mental causes thus work dynamically, or through movement and living force; and from this it follows that at first they can call forth only functional, not organic, disturbances. But any one who has understood the previous chapters will at once understand how such mental causes can produce psychoses and neuroses (mental and nervous diseases).

I must now refer to what has been said in Chapter I. about suggestion; for you must know that with the troubles of purely mental origin suggestion and autosuggestion play an important rôle, because they involve dissociations, fill the mind with some one idea, and allow the emotional wave bound up with it to increase very powerfully, so that it can not only produce lasting effects but also remain slumbering in the brain for years beneath the threshold of consciousness as a so-called psychic *trauma* (a mental or emotional wound). A child is frightened at dusk by some silly

joker who pretends to be a ghost or the devil. The fright and the image of the ghost remain in the memory, appear in dreams, and terrify the child afterwards on every occasion; for now the slightest hint or the most insignificant incident gives new life to the memory. In consequence of it all there may arise hallucinations and imperative ideas and phobias and hysterical attacks. A very frequent source of such emotional injuries is formed by sexual occurrences; such as indecent assaults upon children or young girls, or excitements of the erotic fancy. Of course the disposition of the individual plays a prominent part here, as the following case, which I observed, will show: A married man was mentally affected (with paresis, the result of an old case of syphilis). An insane passion at the beginning of his alienation caused him to attempt an indecent assault upon his daughter. The innocent child did not understand the situation and did not trouble herself much about it. The mother on the contrary became fearfully excited, and six years afterwards she is still suffering from serious sleeplessness, mental agitations, and depressions in consequence of the affair; while the daughter, who has grown up in the meantime, remains perfectly calm and has to quiet the mother about it. The matter is easily explained by two circumstances: *a.* At the time of the event the mother understood its seriousness, the daughter not; hence the strong emotional effect upon the former alone. *b.* The daughter is naturally more normal, has more mental poise.

In consequence of the idea that she could not sleep and of her anxious efforts to put herself to sleep by an act of will (a frequent cause of sleeplessness), a working woman suffered for a year and a half from total sleeplessness. I then succeeded in curing her by means of hypnotic suggestion. A gentleman slowly develops the suggestion that every emotion he has causes diarrhœa, and the thing becomes an awful nuisance; he has to take opium every day to avoid it. But in reality opium only constipates for a short time; when it is used continually it is a direct cause of diarrhœa. Here a cure was effected by counter-suggestion and the removal of the opium. On the other hand, many people get constipation by auto-suggestion and keep it up by the continual use of laxatives which get the central nervous system out of the habit or normally innervating the bowels. Many menstrual disturbances, uterine pains, disturbances of men's sexual powers, continued hysterical attacks, and even regular psychoses are the results of autosuggestion. A whole set of nervous disturbances can still be cured by suggestion, and doubtless arose through suggestion or autosuggestion, such as many cases of bed-wetting and other performances which with children are generally called naughty. A large part of pedagogics rests on properly understood and applied suggestion, and it forms the best of curative agencies, yet one that can only be effective when bound up with trust and affection, never with repulsion. A gentleman was brought to me in

the asylum because he was obeying voices (hallucinations) which commanded him to smash the furniture in his room at an hotel. He declared that he was persecuted by spirits who gave him absurd commands, amongst others to smash things. This was absurd to be sure, and he knew it, but yet he had to do it at last to be at rest from the spirits. Then he explained how he had been amongst spiritualists in America and learned to see and hear the spirits. From this we concluded, for he was reasonable in other respects, that his delusion of persecution had been suggested to him by the spiritualistic ideas. I hypnotised various people in his presence and then hypnotised him too, declared with authority that I had cast out the spirits, that my power was the stronger, and that from now on he would hear no more voices and be well again in every way. And so he was cured. With hysterical people especially, regular mental disturbances can arise through suggestion and autosuggestion, and be cured only in the same way. Dr. Freud in Vienna has built up a whole doctrine and method of treatment based on the fact of such autosuggestions and the way they arouse the emotions. He calls a subconsciously preserved emotional effect (see above) *strangulated emotion* (*eingeklemmten Affekt*), and with patients in whom it is present he tries by hypnotic suggestion to get back the memory of the original situation which produced the trouble in the first place, for often the patients themselves have forgotten it. Then by quieting suggestions he sets it aside.

This undoubtedly succeeds in certain cases, but the mechanism is not always so simple. Every case is different, and we must individualise extraordinarily if we wish to get behind all the psychological conditions involved in such a trouble. But it is certain that if you gradually win the full confidence of such patients you finally get back to the true cause of their disturbances and find out that the trouble really rests on suggestive effects of strong past emotions, particularly unpleasant emotions, which have established themselves chronically in the brain and continually disturb all its activities more or less.

By *psychic contagion* we understand something that really amounts to a form of suggestion. Many crazy people are so powerfully possessed and carried away by their delusions and at the same time so gifted or energetic and effective in suggestion that they inoculate a whole set of normal people, especially those closely connected with them. And thus we see people formerly sound so infected with the crazy ideas of a husband or wife, father, mother, brother, or sister, that they blindly call all this individual's absurdities good, or even share them and become as undiscriminating and apparently mad as he is. In many of these cases, especially with brothers and sisters, it is difficult to decide whether the common disease is to be ascribed to mutual infection, or whether, in the main, it must not be traced back to the common roots of an hereditary family tendency. As a rule, both factors play a part. For typical cases of infection we may

look to the instances in which the husband mentally infects the wife, or *vice versa,* for here the effect is undoubtedly produced by suggestion. These cases are not especially rare, and they are not always curable. It is wonderful to see how the infected person will-lessly believes the direst nonsense and thinks and speaks and acts according to the pattern set. In such a case even a complete and lasting separation can not always effect a cure. Yet to be mentally infected in this way one must always have a certain rather strong hereditary predisposition. The French call the disease *folie à deux.*

Many nervous troubles can be spread by infection, or imitation, especially hysterical attacks, but also other troubles as varied as St. Vitus's dance, headache, and menstrual disturbances. For this reason regular epidemics of such troubles often break out in institutions, schools, and families. Finally, when the occasion arises, vast multitudes of the people catch the suggestion and are carried away by some abnormal individual who regards himself as the prophet of a new faith.

With those who are predisposed, mental diseases can be produced directly and immediately by strong emotions, even by happy emotions. People have been turned mad before now by the winning of the grand prize or the return of a long-lost son or wife; but not so often as by the sudden death of a dear friend, the sudden loss of means, or a destructive or dangerous fire. On the whole, however, these cases

are rare, and are mentioned frequently only because they make a strong impression. When they are carefully investigated we generally find a strong hereditary disposition at the bottom of them.

A more frequent cause of mental and nervous disturbances is to be found in lasting or oft-repeated emotional excitements, such as matrimonial quarrels, anxieties about food or money, love troubles, sexual abnormalities and misadventures, wounds of honour and vanity, or tormenting bodily ailments. But it is extraordinarily difficult to prove in any particular case that something of the sort really is the cause of a mental or nervous disturbance; for these very situations are themselves generally the result of inherited fauts or peculiarities of temperament and character.[1] So that when we ask how much depends on the inherited pathological tendency, and how much on the acute or chronic feelings to which this led, the question can never be answered exactly; one expert would attach more importance to the one element and another to the other. As a rule, the hereditary disposition is underestimated and the direct effect of the feelings exaggerated. Here we must mention many other false diagnoses, as where disturbances of digestion (dyspepsia) or of menstruation, which were really caused by psychoses, are pronounced by physicians who do not know the brain, to be the causes of the mental depression and disturbance! This con-

[1] See Chapter VII., Group II.

fusion of cause and effect unfortunately occurs every day.

On the other hand, there are doubtless certain modes of life that deeply affect the whole emotional tone and very easily produce mental disturbances. Most dangerous of all is absolute exclusion from all human society, solitary confinement, or the life of a settler on a remote farm, in the forest, or in the wilderness. Then too a perverted pedagogy may produce very bad effects in the nervous system of a child by its injurious influences upon the spirits as well as by mistaken suggestions. An exalted mysticism can lead to melancholia and religious delusions with those who are predisposed. One-sided mental culture with neglected emotions and will often breeds distorted, abnormal people, or at least allows better possibilities to go to seed for the sake of cultivating worse. But this subject can be discussed better later.

3. *Mixed Psychic Causes.* A number of functionally injurious elements can be counted as either bodily or mental—for example, the disturbance of sleep. Sleep is at once a mental and a physical condition. To restore the exhausted brain, repose for its neurones is essential. This means that health and normality cannot be preserved without sufficient sleep. Continued prevention or disturbance of sleep, excessive vigils, night work, and the like injure the mental poise, *i. e.*, the action of the brain, and can provoke lasting functional mental and nervous disturbances. The same is true of all one-sided, extreme

abuses of the brain, some of which we have already mentioned.

The sexual life can have a hurtful effect in many ways: Either (1) through continued purely mental excitement and the dominance of sexual images which finally fill the person completely; or (2) through exaggerated sexual enjoyment. This latter again can injure the nervous system either by direct exhaustion and loss of stamina or by the violent emotions which it often involves, such as those aroused by unrequited love or anxiety as to various consequences of the sexual act, such as pregnancy, venereal diseases, tragic scenes, or criminal prosecutions (in the case of sexual abnormalities). With self-pollution and many other so-called errors of sex there are both exhaustion and humiliating and depressing emotional impressions.

Yet before leaving this subject we must speak directly of the great confusion which exists between the indirect consequences of sexual indulgence, such as contagious diseases, and the direct results of the excess itself; and to tell the truth we must say decidedly that sexual excess alone, even when it is abnormal, does the least direct injury to the nervous system with people who are otherwise sound. The principal injuries result (*a*) from the emotional agitations connected with it and the awkward social consequences, and (*b*) from veneral diseases. And yet there is no mistaking the fact that there are injurious consequences of repeated over-excitements, especially with men, even if the connected emotional and suggestive

elements do play a decidedly leading part. Venereal diseases, on the other hand, work directly by producing specific psychoses (see syphilis above), by the emotional consequences which arise when other members of the family are infected, and by the disorganisation of the general health or of the family life.

D.—General

From what has been said about the causes of mental and nervous disturbances we can see how tremendously complicated they are. One seldom acts alone. The main cause we have found in hereditary tendencies, and the main cause of these again in injuries to the germ plasm, chiefly through intoxications (poisonings), of which alcohol is the most important cause. Then come other unhealthy conditions of life and emotions. Since the main business of nervous hygiene is to remove the cause of mental and nervous diseases, we must ask whether general experiments and statistics cannot point out the way. We certainly cannot set aside all the causes. Injuries to the skull and brain through accidents can never be completely avoided; nor can contagious diseases, suggestions, and emotions. But when we consider that hereditary tendency is by all odds the most important factor and gives a considerable impetus to the effects of all other causes, then we must try to establish the principal causes of it.

In almost all civilised lands we observe a tremend-

ous increase in mental and nervous diseases. According to statements of the cantonal statistical bureau in Berne, there were in the canton of Berne in 1871, 2802 cases of mental diseases (5.6 per thousand of the population); in the year 1902, on the contrary, there were 4836 (8.2 per thousand), and yet both enumerations were taken according to the same method, and the second no more carefully than the first, as I am informed by Herr Mühlemann, the cantonal statistician. Quite as great or even greater increase had been previously found in the canton of Zurich, though here the method of enumeration was more exact the second time; and we find the same relation throughout the whole of central Europe. Insane asylums and nerve institutions grow like mushrooms. Nervousness, mental insufficiency, defects of character, weakness of will, and nervous disturbances of all sorts are racing to burden and complicate our social life and make mankind miserable. There is a corresponding increase in the number of suicides. Crimes are certainly not diminishing, and it is significant that their character is ever more pregnantly and frequently pathological. An attempt is often made to explain the matter by saying that we pay more attention to these things than we used to, take better care of the insane and lock them up oftener, and that consequently the increase is only apparent. We will not dispute the partial justification of such an explanation, but it is not sufficient, and the other factors should not be overlooked or ignored.

Formerly in the good old times they made much shorter work than now of incapable and unsatisfactory people. A tremendous number of pathological individuals that were not pronouncedly insane and yet injured society by their perverse tendencies, by sexual crimes and brutalities, or by drunkenness, theft, and murder, were shortly and summarily condemned and hanged or beheaded. The process was short and sure, for it kept these people from increasing any further and plaguing society with their degenerate stock. Many others starved and quickly came to grief. Even those genuinely crazy were killed or burned as witches. All that is not so very old; we need scarcely turn back two centuries, and that is not so many generations. But our present misguided humanitarianism carefully nurses the whole breed at private and public expense and lets them marry merrily away and increase; while the strongest, healthiest, and most normal people are partly sent off as food for cannon in war, partly tied up as soldiers and servants in peace, kept for a long time from marrying, and consequently given over to prostitution and alcoholism, so that afterwards when they marry they are likely to bring with them serious sources of degeneration for their offspring. Then, too, the sorriest lot of criminals of both sexes, when they are caught, generally get off with a couple of years at the most, and then continue their misdeeds unmolested, and everywhere bring into the world illegitimate children which they hand

over for maintenance and education to the poor-officers and the orphan and foundling asylums. Is it any wonder that the products of such a perverted selection stand out glaringly as noxious social dangers?

But the worst of all, and what increases the bad selection we have pictured to the highest power, is the systematic alcoholising of mankind on the strength of a bad custom, which is old enough to be sure, but which has become an acute pestilence in modern civilisations because the extraordinarily cheap production of alcohol, the easier process for its preservation in bulk, and the easier traffic and transportation have increased its use tremendously everywhere and made it accessible to the poorest of devils, so that instead of the occasional intoxication of our ancestors chronic alcoholism has become a general modern disease. The easy profit which the State and private capitalists draw from the industry make both these powers deaf to the social injury. Their main problem is to help out the budget or "get rich quick," and the popular siren alcohol is the most convenient means; so that the majority, which is always composed of the selfish and cowardly, never wearies of its hypocritical praise of alcohol and ridicule of the abstemious. One need only look at the consequences of the monopoly in Russia, and see how Switzerland, so proud of its free institutions, intended, when the monopoly was instituted, to apply a tenth of the revenue to combat the causes and effects of alcoholism,

but really diverts nearly the whole tenth from its legal uses for fiscal considerations, and with worthless excuses uses it for the building of prisons and lunatic asylums, the support of poor passing travellers, the education of abandoned children, and the stopping of other holes in the cantonal budgets. But what do the statistics show where they can speak? I refer to what has already been said under head A in Chapter VIII. The fact that the tremendous decrease in alcoholism in Sweden and Norway during the last fifty years has put a stop to the increase of mental disturbances and caused a positive increase in the number of able-bodied recruits, while on the other hand the mental and nervous degeneration of the people is strongest in the countries where there is the most drinking,—this throws the clearest light on a main source of the evil. The same lesson is to be learned wherever prohibition communities are contrasted with those where drinking is profuse. To state the matter most strikingly and concisely, there is an increase of crime with an increase of alcoholic consumption, and a decrease with its decrease; and the same is true of suicide. But the frequency of crime and suicide is likewise a clear indication of the amount of nervous degeneration in society, although this is also largely affected by acute alcoholism. Other causes, such as the herding together of the proletariat in great cities, in bad rooms or tenements, with insufficient food and unhealthy employments, undoubtedly weaken the nervous system; but it is

hard to prove their effects statistically, and especially hard to distinguish them fully from the effects of false selection in the statistics and of alcoholism; while the consequences of the last are experimentally demonstrable by positive comparisons between abstinent or very temperate peoples with those under otherwise similar conditions who drink hard, or the conditions of the same people in periods in which the amount of alcohol consumed is different. But after all, the wretched condition of the Jews in Russian or Polish cities shows the results of privation, where alcohol is not involved.



PART III

HYGIENE OF THE MENTAL LIFE AND OF THE NERVOUS SYSTEM



PART III

HYGIENE OF THE MENTAL LIFE AND OF THE NERVOUS SYSTEM

THE task of hygiene is not to cure diseases which are already present, but to guard against all their causes and thus do all we can to prevent them from attacking particular individuals (private hygiene) and the community as a whole (public or social hygiene). As the old saw says, prevention is better than cure. The word "prophylaxis" (prevention) is thus practically synonymous with "hygiene." Every one knows the old motto of hygiene; *Mens sana in corpore sano,* a sound mind dwells in a sound body. But now that we know that mind and living brain are one and the same the motto must really mean: a sound brain dwells in a body that is sound everywhere else; though, to be sure, this is not always true, for a very unsound brain can often dwell in a body otherwise strong and good. Thus we ought to advance the health of both; and that is the art of which we must now speak, on the basis of what has been said in the first two parts. In the first part we learned about the mental and nervous life, its organ and its development; in the second, its

morbid disturbances and their causes. Our present task is therefore to speak of the means for avoiding as far as possible the evils depicted in the second part. The task of hygiene cannot be to replace the physician in cases of sickness or to save from unavoidable death; at the most it can only lengthen life a little, for it cannot upset the natural evolution of the species. But it can do much to mitigate the suffering and torment of existence, to help give death its true form again as the natural end of the individual's evolution, and above all to improve our race so sadly afflicted with abnormalities and bad deformities.

We shall divide the hygiene of the nervous system into four chapters as follows:

I. General.

II. Nervous hygiene of procreation, or inheritance.

III. Nervous hygiene of development, or of childhood (pedagogics).

IV. Special nervous hygiene of the adult.

There is a fundamental proposition which I should like to lay down before I begin this third part: *Public, or rather social, hygiene should everywhere be superior to individual hygiene when there is a conflict between them; and there are many conflicts.* In other words, the hygiene of the nation has precedence over that of the family. If we conceive of hygiene from this higher social standpoint, and it is our duty so to do, there can and should be no conflict between hygiene and ethics. Nay, the conceptions of social

hygiene and of ethics coincide in an ideal harmony for which we should strive, however many difficulties and conflicts may arise in concrete cases from the defects of our customs, our laws, and our knowledge.

CHAPTER IX

NERVOUS HYGIENE IN GENERAL

NERVOUS hygiene consists of two sets of rules for the conduct of life: negative and positive. To the first belongs all that we must avoid; to the second, what we must do.

1. *Negative.* In Chapter VIII. we discussed the causes of mental and nervous diseases. The first task of hygiene is to avoid these causes as far as possible, and I shall not repeat here what was said *in extenso* there. No magic can remove an hereditary tendency once present, but by avoiding all that is injurious we can guard more or less against its unfolding, and by positive training we can gain or develop opposing forces. But above all, and this is not difficult, we can despise fashion and prejudice and with a little energy keep far from us one powerful group of injuries, the various kinds of poisoning. Hence the first rule of hygiene: "Do not make yourself sick by artificial means and do not use such means to kill your nervous powers." Accordingly we believe that the first and fundamental condition for the preservation of the health of the nervous system is consistent, life-

long abstinence from all poisonous means of enjoyment, especially from all narcotic poisons, and most especially from all kinds of alcoholic drinks. In this requirement we must suffer no weakness, no half measures. It belongs to social hygiene and to the hygienic duty of every individual towards himself, his family, the state, and society. And even though this or that egoist, who feels himself very strong and likes to tickle his palate with beer or fine wine, should explain a hundred times that he personally is not injured by a very moderate use of alcohol, yet in view of the social mischief that he prepares by his example we should not accept this excuse. All those who apparently enjoy alcohol, opium, and the like in moderation are not only, as von Bunge so strikingly says, the betrayers of those who succumb; they are the only source, if you like, the "ovary" of alcoholism and all the poison-epidemics which always draw after them the weakening of the human brain and nervous system. The question can actually be summarised in this way:

If a stroke of magic should remove all the victims of alcohol, morphine, and other narcotics to-day, they would be replaced again in a few years by others; for though thousands die off every day, their number is continually growing. If, on the other hand, all moderate drinkers and moderate users of narcotics should be converted into total abstainers, there would soon be no more drunkards or narcotic fiends at all. Every one of those who are badly poisoned began

with the moderate use; they are all recruited from the ranks of the moderate.

All the reasons given in favour of the use of narcotics, and especially of alcohol, are sham reasons and rest on sophisms. Let people courageously leave cordials, wine, and beer alone and drink water, milk, or fruit juices, and for all I care a little tea or coffee so far as it does not interfere with their sleep, and they will protect themselves, their families, and the next generation from every degree of alcoholism and from its consequences. The recipe is very simple, and has stood the test everywhere. In Canada, Norway, New Zealand, the United States, and England, millions of total abstainers get along magnificently. With us Swiss, too, the movement is slowly beginning. God speed the discerning who will join it in ever-increasing numbers, the sooner the better! Cowardly and pusillanimous delay only brings new injuries, and through it thousands of families are ruined. So far as possible, especially with nervous diseases, avoid narcotic remedies, such as opium, morphia, cocain, hashish, chloral, trional, sulphonal, and the like. We must also give special warning against two new methods of corruption with which we are threatened; opium smoking and the inhalation of ether.

Only with cool unpoisoned heads will a new generation be in a position to make new strides in culture or to carry out the other hygienic measures of which we have still to speak. That is why we give

the first place to the fundamental rule of abstinence from all poisonous indulgences.

Unfortunately drinking habits and customs are so rooted in our culture and supported by such powerful prejudices and monied interests that nothing short of a gigantic organised campaign over the whole surface of the earth can do away with this social pest. Such a struggle will have to be directed at the same time against all narcotics as means of enjoyment, for each helps the other and by its special attractions easily leads to bad habits and social customs. Therefore every sound person, be he man or woman or child, who wishes to remain sound and have sound offspring, and still more every one who has any sort of nervous trouble, is urgently recommended to join some total abstinence organisation, so long at least as the drinking custom dominates. Such organisations furnish a society free from alcohol and other narcotics, and corresponding associations; they have appropriate premises and temperance restaurants, and give the weak support and protection against the temptations which assail them everywhere.[1] To

[1] These organisations in German-speaking countries comprise first and most consistent of all, the Good Templars, who carry on a most energetic social campaign against alcoholic beverages (organ: *Der Deutsche Guttempler*, Eppendorferweg 265/67, Hamburg; *Der Schweizer Guttempler;* Lehrer Zehnder, Birmenstorf, Aargau). Then the Alkoholgegnerbund, which is less stringent (organ; *Internationale Monatsschrift zur Bekämpfung der Trinksitten*, Verlag von F. Reinhardt, St. Albanvorstadt 15, Basel). Further, the Verein der Abstinenten in Vienna (organ: *Der Abstinent* II Nordbahnstrasse 30, Vienna). Then there are religious unions, such as Das Blaue Kreuz (protestant-orthodox) or the Catholic Abstinence League, and business and professional unions, such as the

such organised armies of abstainers must be unconditionally ascribed the victories of the social movement which we have mentioned in the Scandinavian peninsula as well as in the Anglo-Saxon domain. To this movement the hygiene of the brain and nervous system is infinitely more indebted than to all previous good counsels, teachings, phrases, and declamations; for they fight the evil where its roots are deepest. But this is not the place to go into the details of the fight against alcohol. He who is seriously interested in it can subscribe for the appropriate papers, procure the anti-alcoholic documents of the Central Literary Depot of the Opponents of Alcohol,[1] and take part in the periodic anti-alcohol congresses. I must make special mention of the excellent and very full book of Dr. Matti Helenius, *Die Alkoholfrage,*[2] and Hoppe's *Die Tatsachen über den Alkohol.*[3]

unions o abstinent teachers, physicians, railroad workers, merchants, (*Kaufmännische Abstinenzblätter*, Max Warming, Emilienstr. 21, Hamburg 19), workmen (*Der Correspondent für abstinente Arbeiter* Dr. Otto Juliusburger, Schlachtensee bei Berlin), etc. Especially important are the academic unions of abstainers in secondary schools and colleges: in Germany the Union of Abstinent Students and the "Germania." Then there is the Abstainers' Union of German Schools (organ: *Die Abstinenz*); in Switzerland the "Libertas" in the colleges and the "Helvetia" in the secondary schools (organ: *Korrespondenzblatt für studierende Abstinenten*, Zeltweg 66, Zurich V). There is certainly no lack of organisations for all c asses and calli There are also abstinence societies in Germany and Switzerland for women, and the children can join the "children's temples" of the Good Templars or the Band of Hope of the Blue Cross.

[1] Address Alkoholgegnerbund, Postfach 4108, Basel, Switzerland.

[2] Published by Gustav Fischer, Jena, 1903.

[3] Berlin NW 7, S. Calvary.

It is hardly necessary to say that we should protect ourselves from other nervous poisons such as lead and carbonic oxide; that it is better also to avoid tobacco; and that we should be moderate in the use of tea and coffee, as indeed in all our eating and drinking.

As to the other causes which we must combat I refer to Chapter VIII., to avoid repetition. Let us turn now to the general positive measures.

2. *Positive Measures.* (*a*) *The law of training or habit.* We have seen already that both the substances of muscles and nerves and their power of exertion are strengthened by exercise and weakened by inactivity; and that in the same way facility and skill in carrying out complicated activities are improved by frequent repetition. This fact is quite general and can be stated as a law of exercise applicable to all muscular and nervous action: Strengthening and increase through exercise; weakening and stunting through inactivity.

It is at once apparent that the law of exercise stands in a certain opposition to the law of inheritance. Inherited energies are transmitted through the germ plasm of our ancestors, while the law of exercise represents the attainments of the individual. But it is a fundamental error to put the two laws in such opposition that we regard every single mental or nervous faculty as "either inherited or acquired." Much rather is every one of these faculties both together, inasmuch as no faculty can be attained without a

certain inherited tendency and the best natural tendencies are dwarfed when not developed by exercise. We can therefore say that the main task of our individual culture lies in the development of our good and the suppression of our bad tendencies through proper exercise, for the sake of fashioning an harmonious personality. That is also the task of a proper nerve hygiene. Here we must not forget that the term "exercise," or "practice" or "habit" (*Übung*) is by no means to be confined to muscular exercise and technical dexterities, but is used in a broad sense to include the exercise of all mental and nervous faculties. One exercises himself in seeing, hearing, perceiving, thinking, abstracting, in ethical and æsthetic feelings, in standing heat and cold, and in carrying out his resolutions, unfortunately, too, in lying, swearing, gambling, sexual excesses, or idling, precisely as much as in cycling, fencing, cooking, or polishing. But the law of exercise gains an enhanced value in the light of the mnemetic phenomena already discussed in Chapter V. It means a strengthened many-sided engraphy which as such not only increases the capacities of the individual, but also quietly cultivates later ecphories, though perhaps only infinitesimally, for much later generations.

Proper exercise consists of regular training in which all sudden overexertions and feats of strength are avoided. We gain slowly but surely in strength and skill when we persistently repeat things every day, or at least very often, and each time do a little

more. Here there is a fundamental difference between muscular and nervous tissue. By continuous, increasing activity the muscle is strengthened and enlarged rather quickly, and then through long rest and inactivity it quickly loses what it has gained. But what has once been thoroughly worked into brain and nerve centres in general is preserved at least in essence so long as the tissues retain their health. Thus knowledge and finer feelings and technical facilities are preserved on the whole for years, though not strengthened by exercise. Even when we think we have forgotten, a very little repetition is enough to restore our former attainments. The neurone thus possesses a cumulative power of attaining and preserving which is almost foreign to the muscle. Even the intestinal and visceral nerves can be practised.

The preservation of health and the strong development of the nervous life thus demand a constant exercise and further development of this life during its whole duration from birth to death. It is false to believe that we have to learn only in youth; we have never finished. Learning or the working in of new nervous activities belongs to the foundation of a sound nervous hygiene, to the preservation of nervous force, and the elasticity of nervous action. He who is not constantly learning and exercising not only loses strength but runs the risk of becoming mechanical, automatic, stiff, and awkward, of falling into a fussy routine, from whose deeply ingrained and ever-

identical path he will then find it harder and harder to tear himself. The most beautiful hereditary gifts, the best brain-forces, become dwarfed in inactivity and also in one-sidedly repeated action that never practises new paths.

The following points are to be especially noted in regard to the law of exercise:

Though practice makes perfect, this is not true of overexertion to the point of exhaustion. The nervous system unconditionally demands the restoration of its substance after vigorous action, and for this restoration are necessary, first, sufficient nourishment derived from food and conveyed by the blood, and, second, adequate periods of repose for the neurones. This is not the place to discuss the hygiene of digestion, of the circulation, and of the bodily nourishment in general. I refer, amongst others, to the books of the *Bibliothek der Gesundheitspflege* [1] and only remark that the brain, which is rich in blood, demands proper nourishment for its work of thinking, feeling, and willing. This is forgotten far too often, especially by adherents of the dualistic point of view, who conceive of an incorporeal soul dominating the flesh and drawing its strength from the Nothing through God knows what ascetic practices. Mystical dualistic notions of the world have sinned grievously against hygiene by regarding mental work as something outside of bodily functions and thinking that by fasting and mortification they can strengthen the

[1] Published by C. H. Moritz in Stuttgart.

spirit and subdue the body. There is a soul of truth in this I admit, yet only in the sense that mankind eats too much, drinks a great deal too much, and overdoes things sexually, so that a little fasting on a cold-water regimen is excellent, especially with the well-fed and gouty, and sexual continence is much more healthy than excess. On the other hand, asceticism is uncommonly hurtful when it leads to sleeplessness, to chronic underfeeding, and to an unnatural mode of life; for these end in exhaustion, all sorts of nervous disturbances, and not seldom insanity. Proper nourishment should be moderate but sufficient and free from extremes and excesses.

But here we meet a frequent objection. When we warmly recommend bodily exertions, technical dexterities, cycling, and other sports, people come to us with the scarecrow of dilatation of the heart and other injuries which bicyclists, racers, and other athletes have brought on by their violent exertions. These bad effects of such muscular exertions, often overdone to the point of absurdity, are due principally to the fact that the law of exercise has been completely misunderstood and broken. In place of a slow and prudent training which always secures restoration, repose, and reconstruction for the tissues, foolish overexertions are made in a short time and superhuman efforts are expected from the human body without sufficient preparation. One should not get out of breath and put his heart into violent palpitations; and if he trains himself as did Frithjof Nansen,

for example, that does not happen. Further, the people who are injured often allow themselves moderate or immoderate quantities of alcohol between or after contests; and this tends to weaken the muscle of the heart, and leads or predisposes to dilatation. The man who has always left alcohol alone and is at all reasonable and prudent in his training will not get fatty degeneration or enlargement of the heart so easily, even if he is weak.

(*b*) *Sleep.* To supply nourishment to the nervous system is not sufficient in itself; for a continuous exertion of the neurones finally reduces them to a state of exhaustion which may be so marked that it can be shown under the microscope in the ganglion cells (Hodge and others). Hence time and rest must be given to build them up again through the blood. Simply sitting or lying down gives opportunity for this to the spinal cord and ganglia; but the brain, the organ of thought, requires sleep. In other words, the cerebral neurones which have been working together must be relieved from their concentrated activity of attention. The importance of sleep as rest for the brain has been much misunderstood. The more we work mentally the more sleep we require. But strenuous muscular exertion in what we call "bodily" activities, such as walking, riding, digging or factory work, means work for the brain too, and also requires sleep.

All sleep is by no means of equal value. Many people think that they do not sleep, because their

sleep is light and there is not a complete break between the chain of their dreams and the chain of their waking consciousness. Such a total break is indicated by a complete amnesia (or forgetting), and if we know nothing more about the time when we were asleep we say that we have slept very well. And yet some kinds of light sleep give more rest than certain kinds of apparently deep sleep, namely those in which there are nightmares or vivid dreams or even sleep-walking (somnambulism). There are sleep-walkers who even do heavy housework in their sleep. To be sure, when they wake up they have the feeling that they have slept soundly, and yet they are very tired, exhausted, broken up. By hypnotic suggestion sleep can be localised. Then only a small part of the cerebral activity sleeps, while the remainder is awake and the man thinks from that that he is altogether awake. But on the other hand a whole train of localised activities can be kept awake during the deepest sleep. Thus as director of the insane asylum at Zurich I was able to induce a deep, refreshing sleep with certain attendants and yet to practise them so that they noticed certain dangerous proceedings on the part of patients and immediately awoke when the patients in question began an attempt at suicide or anything else improper. A mother may sleep away peacefully in spite of her husband's worst snores yet wake at the slightest whimper from her infant. By suggestion I made a person unable for a considerable time to find a word when she was talking, though she

knew it perfectly well; that means a very circumscribed dissociation, or circumscribed sleep. From these few hints it is evident that we cannot lay down any absolute rule as to the amount of sleep that anybody needs; and if we demand at least seven or eight hours for the average adult, this cannot be taken as an absolute rule. Many elderly people whose life is regular and does not demand much thinking get along very well with five or six hours, or even less, because when they are awake they have many periods of rest which are often half as good as sleep. On the other hand, it is often a good thing after very strenuous exertions of the whole nervous system to make up for the exhaustion by long subsequent sleep.

It is also of high importance for hygiene to train yourself in sleeping, *i. e.*, to get the habit of being able to sleep at any time and not be tied down to definite hours and places. By mollycoddling we make sleep harder. A person can accomplish more if he is able to go to sleep at any time, on any board, in any third-class railroad carriage, on any chair, so long as he only has the time. The best way to ruin sleep is to misuse the evening for the hardest mental work and strain to keep awake or artificially force yourself to it with large doses of tea or coffee. Forced brain action of this sort is unhealthy to the highest degree. But it is worse still to get the sleep back again afterwards by narcotics. Sleep induced in that way is really a kind of torpor brought on by poison and gradually drives away natural sleep, be-

cause the brain is chronically poisoned and at the same time trained to depend on artificial aids to sleep. Any one who accustoms himself to opium or morphia gradually becomes completely sleepless, unless he has the aid of these drugs. A natural, harmonious mode of life is the best mode of avoiding sleeplessness, and hypnotic suggestion the best means for gradually removing any disturbances of sleep that may have arisen and for again attaining normal sleep; which should not then be endangered afresh by inappropriate modes of life.

The fundamental conditions of a sound brain and nerve life are thus a normal hereditary disposition, the avoidance of poisoning, especially chronic poisoning, constant exercise, good nourishment, and the necessary sleep. These foundations of nervous hygiene should not be disturbed; a few short transgressions against them may be borne if one is good and strong; but if anybody breaks one of these rules continually he pays for it with at least a part of his nervous health. Yet here, too, inherited tendencies play a tremendous part, and while strong normal people can stand relatively many encroachments on the law of exercise, of sleep, and of nourishment, those with psychopathic tendencies often succumb to very slight excesses.

3. *Harmony and Choice* (*Wahl*). In the first four chapters we learned how many-sided nervous activity is. If any one exercises only one given activity, such as a definite muscular movement, the

muscle in question undoubtedly becomes very strong, and so does the corresponding path of neurones. But then everything else can be stunted. The same is true of a person who spends his whole life riding to death some one circle of ideas or feeling or habit. In this way people who are not exactly crazy can become monomaniacs; like the chess-player whose whole life is filled with chess, the mother whose love for an only child so outgrows all other feelings that it degenerates into an idolatry that is highly injurious and leads to all sorts of follies, or the man who has turned all his energies to a petty invention that is going to make him rich and wears himself out, often for nothing. All these one-sided exercises involve a stunting of the other brain activities, and unless they be exercises in the useful arts, they seldom lead to anything profitable. A good hygiene of the nervous system thus includes an harmonious exercise of all parts of the nervous life,—of concrete sense-perception, of all muscular actions, of intellect, of feeling, of will, and also of imagination, the combining tendency which opens new pathways for the brain's action.

Here it will be objected that the tremendous specialisation of knowledge nowadays is directly opposed to any such harmonious development. In theory it sounds very well to demand that the brain and all the rest of the body shall be harmoniously developed in every respect, but that will not get you anywhere in the world; it does not give the necessary dexterity in special fields. I admit that " the shop " does seem

to have become the modern ideal with many people; but those who understand culture in that way do not understand how blind their one-sidedness makes them and how much they have to suffer on account of it. We do not by any means overlook the necessity for division of labour and the one-sided training in certain departments which it involves. But it is a colossal error to begin this in youth and to be so hypnotised by the details of a trade or profession as to neglect the harmonious development of the brain as a whole. Without this last the whole life is stunted and when the whole life is stunted the individual part comes to grief as well. The judgment also suffers because the individual overestimates his special field of activity and misunderstands the significance of others, thus viewing everything one-sidedly and falsely. Any one who sets out from earliest youth to exercise only one part of his brain and let everything else go to seed runs the risk of going to pieces with constitutional mental abnormality, insanity, weak-mindedness, or bodily sickliness, such as tuberculosis. We can therefore lay down the following practical rule.

Cultivate all your nervous and mental activities harmoniously all your life long in order to keep the whole machinery, from the highest faculties of abstraction to the coarsest muscular powers, healthy and capable of discriminating work. Then to be sure you should attain thorough knowledge and dexterity in at least one branch and master it completely, so as to have a calling. Any one with normal health who avoids all

narcotics and consistently obeys the law of exercise will find that these two aims can both be followed together excellently. Through the general harmonious development one attains or retains his well-being, his elasticity, and a broader horizon, as well as a sound faculty of judgment, normal feelings, and the power of resolution. By the specialisation in one or more fields (in several if one has the strength and capacity) one learns to respect thoroughness and to overcome difficulties, and he avoids falling into a flat dilettanteism through superficial and hasty generalisations; one learns to realise that in every branch of knowledge progress is only possible through deep penetration; one is more modest and learns at least to value and respects other fields of knowledge in which he is not sufficiently at home, because on the one side he recognises their importance from their connection with the whole and on the other he learns from the difficulties which he encounters in his own field to respect those of the other. He thus avoids the two greatest dangers of mental development, superficiality and narrowness. When we speak of harmony we must insist once more upon the great importance of the life of feeling and will. What good does it do to appropriate a mass of knowledge if it withers your spirit or if you cannot use it? The effort to adapt ourselves to the higher ethical requirements, fulfil our duties towards our fellow-men, and foster the feeling of solidarity; the cultivation of the ideal and training in consecutiveness, persistence, and the exe-

cution of resolutions though it may take years to carry them out;—these things keep building character during the whole of one's life and thus have far more value even for the individual than a one-sided encyclopædic sciolism.

One must not only have a specialty or life-work, but must exercise his muscles, his senses, his thought, his feeling, his fancy, and his will consistently and in every direction.

Moreover the law of exercise must be brought into harmony with inherited tendencies. Undoubtedly patience and persistence can teach an unmusical person to pound the piano, and make a banker out of a born artist. But that is taking a great deal of trouble to make bad bankers and bad musicians. The greatest folly which parents can commit is to force their children into callings for which they have no aptitude. What we have already said under head "2" [1] gives us the key to the right procedure. The harmonious development of the brain no doubt requires the exercise of faculties for which one has no special taste and no talent; and this is very good, for we cannot afford to let any part of our nervous life go to waste. But what we have said is not true of specialising. A clumsy person should learn gymnastics and swimming and cycling, but not become a teacher of gymnastics or a professional swimmer. An unmusical person may learn the notes and I think he might also try his hand at strumming and

[1] See p. 243.

singing, but he should not inflict his attainments on others; and on the other hand, he should specially cultivate the things with which he is naturally fitted to accomplish something worth while. If one will proceed as we have suggested even though he be a simple working man, the constant contact between his general culture and his special knowledge will broaden his mental horizon, bring about excellent combinations, and continually open new roads to the spirit; he will cultivate himself throughout his whole life. Of course individual talents are very different. He who has little talent of any sort should not force himself through vanity to try and conquer unattainable fields. There are many healthy and modest callings which offer full satisfaction to moderate or inferior talents, if one will only take the trouble to make constant progress in them; such as agriculture and the simplest trades. But with these very callings it is most necessary to fill out one's free time with continued harmonious cultivation in other directions, while unfortunately most people dissipate it in idleness and crude, stupid pleasures. Think how much peasants could do for their culture on Sundays and winter evenings and how much it would add to their pleasure and the joy of living and their mental elevation! And then think how much the proletariat of the pen, the sewing machine, and the shop would gain by chopping wood or other simple, useful work, by gardening and nature study, not only in the matter of bodily health but even—you may solemnly shake your head

if you like—in mental horizon. Our ideas of the Sunday rest are fundamentally reversed in many ways, because the relations of things have changed completely since the time of Christ. It is absolutely ridiculous that in many places religious narrowness and bigotry make such unreasonable and often tyrannical prohibitions for Sunday, such as the prohibition of farmwork, chopping, and the like. Pure idleness and, still worse, the customary drinking and jollification (*Kneipereien*) make a perfectly immoral and unhygienic Sunday rest; and though the farmer, the smith, or the postman undoubtedly spends his Sunday most advantageously in reading and the cultivation of his mind, the clerk, the writer, and the seamstress find the best and healthiest Sunday recuperation in muscular exertion, and for them sawing word or work in field or garden would be a good deed.

Nay, more! Change of activity makes certain apparent excesses of work permissible, because it enables some groups of neurones to rest while others work. And moreover the elasticity of the brain and its power of adaptation are trained by such changes. One learns, so to speak, to quickly close or open the "switch" between one activity and the other. And thus one becomes *freer* in the true and profound sense of the word.

4. *Natural and Artificial.* The expressions "nature," "natural," "natural way of living" are nowadays badly misused. Every one gabbles about

them and nobody knows exactly what he ought to mean by them. The contrast between natural and artificial is relative throughout, and most people understand by natural only what their prejudices and their routine suggest to them as such. In reality everything that human art has created is quite as *natural* as any other product of nature, for man is himself a part of nature and his products are only the offspring of his natural mind, *i. e.*, of his brain. By no means, therefore, should hygiene despise art and science and their products, but, on the contrary, it should make clear to itself which of them are favourable to a healthy normal development of our civilised races and which are harmful. It is often said that man ought not to trespass upon the government of nature, and so on. These words are ambiguous, and require an exact analysis, for the blossoms cultivated by the new-fangled "science of natural therapeutics" (*Naturheilkunde*) are of a kind to imperatively demand it.

Yet in the criticisms of medical science on the part of those who call themselves nature-physicians as well as in the cry "Return to Nature," there is this much correct, that the growth of individual branches of knowledge in the medical schools, in most sanatoriums, and amongst scientifically educated physicians in general, has built up a fateful error, which, however, is to be ascribed, not to science, but to human weakness. While pure science is continually investigating and doubting, because every discovery it

makes arouses new questions, the art of medicine, on the contrary, demands immediate action, no matter whether we know or not. The patient wants to be cured and he generally wants to be deceived as well. This is as old as the world, and the answer to be made by the medical artist is only too obvious and convenient: "Be humbugged; you will be satisfied and we shall have our profit." Nay, every one knows that even the most honourable physician cannot possibly get along everywhere with the plain truth; pure humanity itself demands of him many a pious lie. The consequence is that in the tremendous complexity of symptoms and the difficulties of diagnosis, prognosis, and treatment to which they give rise, the physician involuntarily gets into the way of filling in, where he does not know, with little dogmatic assumptions and compromises with his conscience; and that puts him in constant danger of falling into the fundamental evil of slap-dash work and humbugging. And he finds those methods of treatment most convenient whose effectiveness or ineffectiveness cannot be scientifically demonstrated.

The most convenient method of all is to try and make use of chemical influences on the bodily processes, and, more especially, to prescribe the medicaments of the apothecary; because we know practically nothing of the chemistry of life and we simply do not know how they affect it. We see only certain striking mediate or immediate effects which greatly impress the patient, but we overlook and misunderstand

all the concealed subsidiary effects which may be lurking there and often only come to light after a long time or are never recognised as such at all. Moreover we ascribe to all sorts of so-called remedies effects which are due to nothing more than pure suggestion, *i. e.*, to the confident idea of the patient and its influence on his brain, and through the brain on the rest of his body. These serious defects of medicaments (of the druggist's "remedies"), except the poisoning, are also to be found in all the possible and impossible "physical remedies," such as electricity, water-cure, bath-cure, and so on. How all the nonsense is supposed to work, no one has any definite idea; and on this account all the more phrases and grandiloquent pseudo-scientific discourses are thrown at the public, often for the pure sake of money-maknig, and they do not fail of their effect with the credulous masses. In these cures also a principal part is played by suggestion; though to be sure healthy muscular activity, good air and nourishment, and improved digestion also contribute to the favourable results. The fun of it all is that every quack claims "Nature" for himself. Every one of them has the only proper natural method; but what Nature is he knows no better than the rest, for it is not such a simple question as it seems. Almost all of these curative agencies, so far as their effects are due to anything objective, can be found cheaply enough in the open country without expensive "cures," and the bathing salts of the cura-

tive waters could be cheaply replaced by almost any spring.

In reality precious little can be gotten out of the words "Nature" and "natural." It would be far better for medicine if the patient as well as the physician would be honest with himself; if the patient would always say to the doctor: "Doctor, if you do not know exactly how the remedy which you recommend works and why you give it, then I 'd rather you would leave it alone," and if the physician had the courage to say to the patient: "Since there is nothing to do but have patience, I 'll give you no drugs that do no good, and I 'll not send you to expensive baths when a couple of bicycle trips or vigorous walks on the mountains will do you as much or more good."

I certainly do not mean to condemn all chemical and physical remedies by the wholesale; but it is certain that people generally use ten times too many remedies and cure places, and that by way of reaction this misuse has at last called forth the unscientific fanaticism of natural methods with its uncritical and crassly ignorant calumnies of scientific medicine. But this will have the benefit of compelling people to gradually introduce more criticism and more honour into the healing art.

We must now accept the following standpoint. In such a confused region as the metabolism of the living protoplasm, and especially of the nervous elements, a region to which we have no strictly scientific guide, the only thing to decide is a sound, objective, practi-

cal experience. We must not toss words and dogmas and sententious phrases about, but submit every part of our supposed information to a careful, critical examination. In so doing we should reject much that appears natural and accept much that passes for artificial, and *vice versa.* For example: A pair of spectacles is certainly the product of human art. Yet any one who is short-sighted or long-sighted or astigmatic is right in wearing them, because otherwise he sees badly and injures himself and it is a matter of experience that properly fitted glasses do him much good and no harm. In the same way it is hygienically better to wear artificial teeth than to allow one's digestion to be ruined from toothlessness. On the other hand, it is extremely natural to expectorate when one has catarrh and to relieve other physical needs. But if one did it everywhere he happened to be, as the "natural animals" do, he would pollute house and ground with bacteria and spread filth and infection broadcast. And so one must make use of a proper handkerchief and other proper contrivances that secure cleanliness and disinfection, unless he happens to be in a forest solitude where the plants take care of it. Such commonplace illustrations could be multiplied a hundredfold, but they are enough to show the mischief that can be made with the words "natural" and "artificial." To talk of natural wine is a sophism; one might as well speak of natural morphia or natural tramways or natural antipyrin; it is only the grape that nature produces without human in-

tervention. And even here we might quarrel about words and say that our garden fruit and finer varieties of grapes are the products of artificial selection, exactly as we can say on the other hand that fermentation, the action of electricity in the tramway accumulators and the chemical means by which we make antipyrin rest on natural processes.

What we have said here is necessary if we are to succeed in laying the foundation of a sound nervous hygiene, in view of the catchwords bandied about so commonly nowadays by swindle and thoughtlessness. Yet behind the outcry against everything artificial and the call to return to nature there is some truth which only needs to be understood. We certainly make no mistake in designating as natural conditions of life those to which we have adequately accommodated ourselves during thousands of years of evolution. The reader is referred back to Chapter V. (Part 2, Phylogeny), where we find a general answer to the question what our " nature " really is. Culture, however, as we saw, has resulted in an extremely rapid, great, often exaggerated, and enormously one-sided utilisation of the nervous system, especially of the brain, while this brain is in the main naturally and organically adapted to conditions which obtained thousands of years ago or obtain to-day amongst savages. That is why the civilised man is so well—so prodigiously well—when he can spend his holidays running and climbing and jumping in open nature and can behave like a forest ranger, after he has over-

come the first results of his accustomed laziness in the matter of movement and the muscular weakness in which it has resulted. His slumbering ancestry then stirs within him, and all culture seems to him miserable, contemptible, and unnatural. Yet this too is an illusion, only produced by contrast. The man who grows up and continues in this primitive condition is no happier than we, but only exposed to other serious wants and sufferings.

The true art of a sound nerve hygiene thus consists in fitting culture properly to "Nature," i. e., in eliminating as far as possible from culture all injurious and unnecessary excrescences which run contrary to the modified conditions of human life.

We have already insisted in this chapter on the avoidance of all narcotics and have emphasised the importance of the law of exercise; both of these correspond to the requirement just laid down. But we must emphasise a few more points which will help us to attain a normal life. It is thoroughly good to harden one's self and accustom one's self, like primitive man, to stand the rigours of external nature, to fear neither heat nor cold nor moisture nor wind and weather, to sleep out of doors occasionally without catching cold, to simplify one's clothing instead of making it more complicated, to avoid as many superfluous articles of clothing as possible and to honour the greatest simplicity in diet; for, as we have said already, we do ourselves far more harm by overeating, muscular laziness, and mollycoddling than by

excesses in the opposite direction. In this hardening we must carefully observe the law of training or exercise, and proceed gradually and carefully. Before the celebrated polar traveller Nansen crossed Greenland on foot he gradually accustomed himself to it by sleeping (in his fur coat to be sure) in the open air with the mercury ten, twenty, and thirty degrees below zero [from 18° to −22° Fahrenheit]. The greatest mistake that we are in the habit of making is that for fear of colds and sicknesses we practise ourselves in progressive weakening instead of in healthy hardening, and in this way instead of avoiding diseases we become the most downright victims of them. We must let our bodies take care of bacteria and accommodate ourselves to them, instead of living in the delusion that we can capture or avoid them all. If one trains his body regularly with useful bodily exercises he can stand and profit by all that is best in culture without drying up and without languishing for a home in the forest or for Nirvana (the Buddhistic Nothing).

Moreover we must banish pleasure-seeking (but not pleasure itself), from our lives. Every pleasure cultivated for its own sake leads to ennui and disgust and injures the nervous health. Every healthy enjoyment must be earned by an harmonious mode of life. It is a pleasure to sleep, even on a hard bench, if you are tired, or to eat crude dishes if you are hungry. To drink pure water is a healthy enjoyment if you have a natural thirst, and it does not

injure one like the satisfaction of the artificial thirst for alcohol that results from poisoning. Mental work is a healthy pleasure if the need for muscular exercise and activity beside it is also satisfied. Muscular work is a pleasure when alternated with activity of thought and feeling, but not when carried on purely mechanically and automatically without any active attention; for then it does not replace either abstract thought or emotional excitement, which can both be present to lead us astray in spite of such work. Sexual intercourse is a true, pure, and lasting pleasure only when it is bound up with true love. In the long run it needs its natural end, the production of offspring, if it is to lead to unclouded life-happiness. To be sure, human beings cannot always have everything, and in this last respect limitations of which we shall speak in Chapter X. are necessary for the individual and social welfare.

Thus, on the whole, we shall succeed best in adapting culture to nature if we declare a resolute war against all useless social prejudices, above all against luxury, vanities, frivolous amusement, and especially against inordinate longing for enjoyment, which ruins normal pleasures. The amount of time, money, strength, and health we must pay for luxury in eating, drinking, and clothing; the amount consumed in gossip, dreary drawing-room chatter, and conventional visits; the amount swallowed up by bad or inferior pleasures, variety shows, gambling hells, drinking bouts, houses of prostitution, alcoholic and

sexual excesses in general—is immeasurable; and with the physical and moral poisoning, the diseases and weakenings in which it results, this constitutes by far the greatest enemy of a normal nerve hygiene.

A young man well known to me, who has always been abstinent, made long journeys through Europe when only sixteen or eighteen years of age, accompanied only by his bicycle. On one occasion for example, he made a trip of one thousand three hundred kilometres [eight hundred miles] in three weeks, and though to be sure he visited for five days in a big city with friends (which cost him nothing), for the rest he spent only a trifle over five dollars for his whole trip, including repairs on the wheel, and enjoyed himself royally. He spent the night with farmers for about five or eight cents, drank milk and ate eggs with a bit of bread. Although it was the beginning of April so that snow and rain offered him many difficulties, he overcame them all with ease in consequence of good previous training. I call that true and genuine enjoyment of life, and people of very slender means could accomplish it if they would spare the money from alcohol and vanities. Unfortunately these people soften themselves nowadays in the saddest way and thus imitate the degenerate rich. What we have just said is quite as true of women as of men. It is a wholly erroneous prejudice that women are injured or unsexed by physical work. It is well known that in Dahomey the women wage war with the men and these amazons have prepared extremely

unpleasant situations for the French troops. I myself had an opportunity to see the women with the captured king of Dahomey, Behanzin, on the island of Martinique and can testify that I have rarely seen such pictures of perfect health and bodily feminine beauty as were presented by these negresses of Dahomey (apart, of course, from their crinkled hair and negro features).

5. *Psychopaths* (the nervously and mentally abnormal). All that we have just said holds also, though with certain qualifications, for so-called "nervous" people, *i. e.*, for psychopaths and the neurotic, the hysterical, hypochondriacs, etc. It is the very hypochondriacs who are the weak prey of all the cure places and other mercantile enterprises, through which they often come to grief financially instead of attaining the health they hoped for. It is scarcely credible what brilliant results can be attained with functional nervous diseases by consistent training to useful work. But here great individualising on the part of the physician is necessary and we cannot set up any general rules. Only the nerve specialist who is at the same time a good psychologist and penetrates into the mental and emotional life of the patient can find the right course. He must investigate the whole life of his patient and fathom the deepest sighs of his heart, in order to know how to make the proper change in his brain life. And here a comprehension of hypnotism, still unfortunately despised by official medicine and especially in the schools, is almost in-

dispensable. While very many psychopathies and weaknesses of intelligence, feeling, and will can be improved or sometimes even healed only through slow training to a simple bodily activity, such as farm-work, carpentry, gardening, and the like; certain diseases whose sufferings are occasioned or continued more through emotional wounds, unsuccessful callings, or lack of ideals demand an entire alternation of one's whole aim in life. With these concentrated mental work, enthusiasm for a philanthropic cause, a scientific career, or a happy marriage, according to the case, works a direct cure or at least gives pleasure in living and brings about a considerable improvement in their sufferings. Other patients have been affected by certain definite ideas which are often grounded in social prejudices. These are found especially in the sexual realm where many a person reproaches himself with frightful sins, when what he has done was not a sin at all or was due to foolish errors from which the patient can be freed by kindly and reasonable instruction.

As a rule training with psychopaths must be doubly careful. Here in the case of adults one must often begin with a few simple exercises, perhaps with children's dumb-bells or with extremely short walks, until a result worth mentioning is gradually attained, often by the help of suggestion. Many relapses and discouragements are not excluded, and much persistent effort is necessary, but even with such insufficient people one can accomplish much in the end if his de-

mands are not too high. Ten years ago (1893), Mr. A. Grohmann, a civil engineer then in Zurich, in accord and after consultation with me, set himself the task of aiding nervous patients by directing them in regular, individually adapted work. A severe case of hysteria which I had cured in 1891 through agricultural work (a lady who now belongs to the most active and efficient leaders of philanthropic work) induced me to support Grohmann's project, and he thereupon established an employment institution in Zurich. As early as 1894 I communicated my views with reference to it to the *Korrespondenzblatt für Schweizer Ärzte.*[1] Then in 1896, P. J. Moebius threw further light on the subject[2] and directed the attention of the German physicians to it.[3]

To be sure the question here is more one of the treatment of the insane than of hygiene proper. But in the field of psychopathy there are no fixed boundaries between disease and health. Much of Grohmann's experience is well worth taking to heart by every sane person who wishes to protect himself from mental or nervous disturbances.

[1] Sept. 15, p. 57.

[2] *On the Employment of Nervous Patients and the Establishment of Nerve Cure Homes,*

[3] Unfortunately the practical execution of the scheme has taken place as yet in an insufficient way with insufficient means and assistants. Still Herr Grohmann has published a graphic and humorous account of his experiences. I shall mention only his last work about the proposed foundation with Moebius of a suitable health colony, *The Colony Friedau, a Popular Health Home Free from Alcohol,* Zürich, 1902; *Deranged:—Sketches from the Intercourse with the Deranged and their Relatives, for the Laity,* 1902.

6. *General.* By means of a proper systematic training in every sphere one becomes not only happy, but free and rich; rich not always in money, but in capacity for work, and free from the slavery of superfluous and injurious needs; happy in the joy of difficulties overcome as well as in the feeling of health and strength, of increased efficiency, independence, and adaptability. But with reference to freedom from needs I wish to be understood. The winged word of Lassalle the Socialist, "cursed freedom from needs," is not without its justification. Only we must distinguish and separate good needs from bad. Bad are the material needs which enslave people and make them dependent, and all those which proceed from pure pleasure-seeking, vanity, child's play, and luxury; good, on the contrary, are those which drive to useful mental and muscular work. We should therefore be as simple and modest as possible in our clothing, eating, drinking, and dwellings, and in exchange make increased demands upon our selves in the cultivation of our mind and feelings and will as well as in technical dexterities.

Finally we must emphasise again what we have said already that hygiene as such strives only for the prevention of disease by an appropriate mode of life and cannot replace the physician in case of sickness. Whoever has read the seventh and eighth chapters will realise from the large number of diseases there depicted that for a proper diagnosis, prognosis, and treatment a reliable mental and nervous specialist is

necessary. The difficulty is to find or choose him. One must beware especially of the pushing fellows and the physicians with too mercenary a turn, to say nothing of licensed and unlicensed swindlers, who are unfortunately legion. It is surely not necessary to say to intelligent people that all the advertising heroes who trumpet their cures in the newspapers and high-sounding prospectuses, claim to have discovered panaceas, and will restore will and energy to any one who sends six marks are swindlers one and all, who are only out to prey upon the credulity of the public. Moreover one should set aside his fear of the alienist. The director of a state asylum with his fixed salary, and exposed as he is in his thorny place to enmity and calumny through the gossip and lies of uncured or only half cured patients is the very person to offer good security, for the ground on which he lives is not adapted to the growth of fraud. His knowledge of the abnormalities of the human mind gives him practical wisdom which is usually lacking with other physicians. Many so-called nerve doctors who are accustomed only to sanatoria and have confined their studies to the spinal cord and peripheral nerves suffer from the great mistake that they do not know the centre of their own field, the brain and mental disturbances. It would be very desirable to make a higher position for psychiatry in the medical schools and to extend the horizon of the alienist through a widening of his field—*extra muros*—to all nervous troubles, instead of making two persons out of the

alienist and the nerve specialist, which is a fundamental blunder. In cases of doubt and in serious predicaments, a modest and honourable family physician is the best counsellor to begin with. He is also the best person to recommend the proper specialist.

CHAPTER X

NERVOUS HYGIENE OF GENERATION OR INHERITANCE (HYGIENE OF THE INHERITED DISPOSITION)

AS parts of our bodies the ova and spermatozoa can not take care of their own hygiene. We say jokingly that one cannot be too careful in the choice of a parent; but we cannot choose. And simply because no such choice is possible it is our sacred duty to care for the health of our offspring. It is very convenient to say that we must not play the part of fate but must leave the selection of the human race to nature. The animals do that to be sure with a certain amount of success, for they study no medicine, wear no glasses, and do not clothe themselves or take care of the sick and disabled, so that with them death provides for the selection. But when man takes care of the sick and deformed, kills the sound in wars, and makes natural alliances more difficult by cultivating prostitution and venereal diseases, by constant military service, and by destroying normal sexual selection in marriages for the sake of wealth and position; when he cultivates drink and other bad habits, and, in short, constantly plays the part of a malign fate and provides for the deterioration of his race, this

way of talking is the purest hypocrisy. To be sure there is a certain justification for bringing against our requirements the non-success of the Spartan law-giver Lycurgus. But, as might be expected from his times and ignorance of science, he carried out a selection for bodily strength only, and totally neglected mental vigour, and moreover he committed the great blunder of allowing the slavery of the Helots to continue. Thus he helped to breed a people who were physically strong, to be sure, but stupid and lazy. He had forgotten the main thing, the cultivation of work, and history teaches that at last the slaves by their work got ahead of their masters, so that slavery destroyed the latter and not the former.

It is also argued against us that artificially bred varieties of animals and plants are unable to preserve themselves in nature. But here it is forgotten that these races are not selected for their own strength and ability to fight their way in life, but only for the sake of certain qualities which we desire for our own purposes, and that in making such a selection we directly destroy their fitness for the struggle for existence. Thus these arguments are in our favour and not against us, for they both show that we can select if we will. But for the well-being of our descendants themselves we must select (or breed) in them power of work and health and capacity for life's struggle, by avoiding the reproduction of those who are mentally and physically deformed and by furthering that of men and women who are strong and

sound physically, diligent, energetic, and strong-willed, social and altruistic, intelligent, thoughtful, and otherwise good and sturdy.

To avoid misunderstandings we must explain here to those who have theories about inheritance that we do not need to worry about their hypotheses. We are not anxious to produce any new species, any "Übermensch" or "hemo supersapiens." We content ourselves with the well-known *factors* of natural and artificial selection within a species, and we do not by any means neglect the other factors which lie outside of selection, such as nutrition and air.[1] On the contrary, all scientists with theories of inheritance whether they lay greater or less weight on selection, chemical powers, an inner tendency to mutation, or other still more unknown factors are *united in this that the species of animals now extant are related to each other by descent, that we men belong with them,* and that as a general thing individual variations are conditioned by inheritance and sexual crossing, and therefore by selection. That is enough to make it an imperative demand of hygiene that we select the healthy and better, more available qualities within our own species by all appropriate means.

For this, to be sure, we need a sound insight; we must set aside many prejudices, and abstain absolutely from all the poisons that tend to produce degeneration. Of course, it is impossible to specify exactly what our descendants are to be and we must

[1] See Chapters IX., XI., and XII.

deal with the matter only as one of averages and probabilities. A great danger to be apprehended from the misunderstanding of our present scientific knowledge of inheritance is that intelligent but very timid and conscientious natures will overestimate the danger of transmitting some mental disturbance or other hereditary infirmity of their own, their parents', or their ancestors', and abstain on that account from having children, while crude indifferent blockheads overlook all that and regard their own qualities as excellent. Therefore we cannot say too emphatically that we regard the matter as follows:

Mankind must be divided into about two halves: a superior, more socially useful, sounder, or happier, and an inferior, less socially useful, less sound and happy. If we draw a median average line between the two, we can lay down the following proposition. He who undoubtedly belongs, together with his ancestors, to the upper half should multiply vigorously; he who belongs no less undoubtedly to the inferior half should hold back, especially if he is incompetent, unhappy, and socially injurious through mental disturbances, crimes, and nervous diseases; and in this latter case, he should regard it as his duty to avoid the production of children under every condition, more especially when his failings are pronounced in him individually and are plainly matters of family inheritance with his ancestors; and finally he who stands at about the middle should take care to be moderate in the multiplication of his kind.

I hope it is clear that I am far from saying that only persons of great talent and genius should increase plentifully. Indeed there are such things as one-sided, pathological geniuses who are derived from families that are mentally degenerate through and through, whose brothers and sisters are more or less dull-witted and mentally diseased and whose offspring will be for the most part utterly useless. Modest but healthy, good, reliable, industrious peasants and labourers with a good human understanding are the very best material for a good posterity. On the other hand, we must not forget that persons who are now mentally and socially prominent are usually the product of a former happy and favourable selection and that if they have come to wealth and importance this is usually by no means due to external good fortune and good education, but much more to a double portion of the good qualities of the ovum and spermatozoon from which they sprang. If some of them are a bit nervous and many of their faults are more sharply exposed and criticised than is the case with good honest peasants, we must not forget that their public position lays them more open to attack, and that they are often nearly worn out with a tremendous amount of work.

When there is a proposed marriage of capable and conscientious people I have often been asked whether it should take place or not, because perhaps the father of one of them is mentally affected or there has been this or that case of weakness or sickness in the family.

In accordance with what I have just said I have usually been in a position to recommend not only the marriage but also unrestrained production of children. But, on the other hand, with stupid, silly epileptics, imbeciles, habitual criminals, or chronic sufferers with tuberculosis or syphilis I have very often had to warn them most energetically, even though I had not been consulted, that to have children would be perfectly criminal, to appeal to their consciences, and to picture to them the miserable, unhappy, sickly brood that they would doubtless engender. The same is true of course in the highest measure of alcoholics, of the begetting of children in a condition of intoxication, and of opium fiends; and it is self-evident that serious hereditary diseases of the spinal cord, hereditary hypochondrias of the more serious sort, and other such diseases, give promise of no good offspring. If mental and physical cripples who ought not to multiply their kind are in love and absolutely determined to marry we cannot hinder them; but let them see to it no children are engendered.[1]

We must be properly understood: The production of legitimate children should in no wise be diminished from selfishness and the desire for money or pleasure. It should only be regulated and improved in quality because this is a holy duty that we owe to posterity. I am well aware that selfish husbands and affected, light-headed, coquettish women avoid it for the sake

[1] See my book *Die Sexuelle Frage*, Ernst Reinhardt, pub. Munich, 1905.

of convenience, for the preservation of their beauty, or from laziness and deficient love of children. Thus these ladies and gentlemen do not increase so much, and I confess it is no great pity. Good, happy, worthy people who enjoy their children, on the other hand, need only to read the next chapter to be encouraged in the production of vigorous offspring. If any one gives his children a good hereditary disposition as a birthday present it is worth far more than luxury and riches, which only make for degeneration. Vigorous, good, healthy natures fight their way through the world, no matter how poor their circumstances.

Finally I refer to Chapter VIII. for the hereditary influence of poisons and especially of alcohol in blastophthoria or the ruin of the germ. This point is the most important of all in the hygiene of reproduction. Born or habitual criminals, plotters, querulants (who are always getting up law-suits), and other malevolent and deeply psychopathic nuisances are particularly bad and ought to have no children; the same is true of all anti-social people, those bent on exploiting others, and the like, for these scatter the most misery around them. It is fatal that good and capable people of our present civilised society should be misused and tied up in such a way that no time or opportunity is left to them for marriage and the production of children, while these are the very ones (I refer, for example, to capable servants) who should multiply the most. The great question of our monogamy I

shall not discuss here. It is more a name than a reality; for certainly the polygamy of the Mohammedans is not so bad as our prostitution. In any case, our monogamy, which should rest far more on true love and faithfulness than on external legal rules and hypocrisy, should receive the necessary corrections by a facilitation and better regulation of divorce. As things stand in our civilisation with its recognition of prostitution, the hypocrisy which covers illegitimate children and their mothers with infamy, brands them, and puts them to disadvantage, is disgraceful.

Let us deliberately set aside a set of questions of which a great deal is made, but which we regard as extremely unimportant or about which we really know nothing, *e. g.*, the supposed means of producing boys or girls at pleasure, the supposed stronger influence of the paternal or maternal germ on the offspring (we need only notice the tremendous variability of the ways in which children resemble their different parents or other ancestors in order to be persuaded of the hopelessness of such speculation), and the emotional condition of the parent at the time of generation. Any one who understands the scientifically demonstrated conditions of reproduction and has freed himself from prejudice and authoritative beliefs will be able to distinguish for himself between the senseless and improbable and the probable and logical, and demand proof for what has not been proved. For the rest, it is certainly a serious matter to discharge reproductive functions when one is sick,

exhausted, or very badly nourished, for doubtless the reproductive glands also suffer from such conditions, though positive statistics on the matter are hard to get. On the other hand, it certainly makes no difference with the children whether there is more emotion or less or none at all at the time of the reproductive act and what either or both of the parents feel. At least any important proof for an influence of this sort is lacking and all the known facts are against it.

On the other hand, the age of the parent appears, for obvious reasons, not to be indifferent. The children of very old parents are generally weakly and also develop insufficiently mentally. On the other hand, children of unripe parents are likely to be very small and also somewhat defective. But doubtless our modern children suffer more from the parents being too old than too young. Goethe's mother was about seventeen when he was conceived and eighteen when he was born. The best age is probably from eighteen to thirty with women and from twenty-five to forty-five with men; for the development of the latter is decidedly later and slower. And yet a prolongation to forty with the woman or fifty with the man or even a bit longer does not seem to do any harm. It has been stated that children rather tend to resemble the elder of their parents; but this also is by no means proved. If we assume that with strong, vigorous couples the mother generally needs a year's rest after the birth of a child before the conception of a new one

it follows that a woman married at eighteen might have a maximum of from ten to twelve children if all goes well and if twins do not happen to increase the number without prolonging the time. These relations are also adapted to nervous hygiene. Of course, the other hygienic conditions of the body must also be considered. It is evident, too, that the maximum holds only for the most favourable conditions of health; the grounds for limitation have been already discussed. From what we have said and from the experience of life it also follows that it is perfectly normal and appropriate if the man is from five to ten years older than his wife, while a reversal of the relations is abnormal. The fear of girls marrying too young is not justified, and rests partly on the fact that from false modesty they are kept in ignorance of sexual relations so that they become easy victims of deception. But most girls are sexually ripe at seventeen and often earlier.

CHAPTER XI

NERVOUS HYGIENE OF DEVELOPMENT OR OF CHILDHOOD (PEDAGOGICS)

1. *General.* When the inherited nervous tendencies of an individual are once finally determined by the union of the parental cells there then comes the embryological period during the pregnancy of the mother. The hygiene of pregnancy is really a question of good, healthy nourishment. Here also as well as at the time of the child's nutrition through its mother's milk, all poisonings, especially alcoholic poisoning, are extremely injurious. Von Bunge has even shown, as we have seen, that alcoholism with the ancestors seriously injures a woman's power of nursing. It is a frightful and ruinous prejudice to give pregnant women and nurses alcohol for its supposed strengthening power, and injures embryo and child tremendously. Diseases, emotional excitements, nutritional disturbances, and everything else that injures the bodily health and especially the nervous life of the mother naturally have more or less of an indirect effect upon the life of the embryo. Yet since the nervous system of the latter stands in no direct connection with that of the mother it is affected only indirectly through the constitution of the blood that

nourishes it. See the history of the germ in Chapter V.

Directly after birth, when the nervous system, which up to this time had grown and evolved in a purely vegetative way in the embryo, begins to function independently, there begins also the real nerve hygiene of development or of the child. In general everything that has been said about the avoiding of injuries holds here, as well as what was said under the general head in Chapter IX. The tender brain of the child demands special protection and very specially demands the avoidance of all poisonings (most particularly from alcohol) and all other injuries which impede its development. On the other side, this tender organ possesses an excellent plasticity and a prodigious impulse towards activity and development. How shall this impulse be satisfied? This is the problem of pedagogics, and can be divided for practical purposes into two parts, the pedagogics of the home and education in school.

To understand pedagogics properly the adult should go to school with the child; unfortunately he has generally forgotten his own childhood completely and no longer understands it; he must therefore observe the child and ground himself in its nature. Early childhood is in some respects a prolongation of the vegetative embryonic period and what it needs most is good nourishment and a strengthening of the body, especially of the muscles; but on the other hand all the functions of feeling, will, and intellect

develop rapidly at this time and should not be neglected or misunderstood. Bad habits of all sorts, lies and the like, can be cultivated by neglect of the child as well as by bad example, cruel treatment, or overindulgence and doting affection. Strict consistency, exact observation, practice in all that is good, and protection or, if need be, weaning away from all that is bad,—all in connection with love and suggestions of happiness and interest; these are the foundations of a proper training. Unfortunately parents with bad hereditary tendencies are usually also bad educators and set a bad example; while the reverse is true of good parents. Consequently we often attribute to education what really rests, at least to a large extent, upon the good or bad tendencies inherited from the parent. The pure effect of education can be found far more in institutions for neglected and abandoned children, where the educators are not also the parents, and where the results of education cannot therefore be misunderstood or underestimated. In such institutions we can also observe and follow out the effects of good and bad hereditary tendencies.

So far as the intellect or knowledge is concerned, the fundamental rule is to follow the method of "intuition" or object lessons. We must avoid trying to give children finished abstract conceptions which are only comprehensible by adults. The children are not able to grasp them and only learn the words by heart and repeat them like a parrot. *The child must first absorb a great deal of what is concrete.* By the

comparison of concrete sense-impressions it must learn to reflect and understand. Then the abstract conceptions get formed gradually of their own accord, and with little or no learning by heart the brain becomes filled with serviceable and logically-connected memory images, which then form the foundation for sound subsequent views of life and the world. It is a fundamental error that learning by heart something that you do not understand really strengthens a useful memory.

In the realm of feeling, the child should be given a horror of all that is bad and false and selfish. By making him conscious of his dependence upon others we must develop in him feelings of social obligation, conscientiousness, and love of the truth. Not selfish insistence upon what he supposes to be his own rights, but regard for the rights of others, should help to cultivate his sense of fairness. The love for the beautiful should also be cultivated in him. Fear must be combated by training to courage and independence, as well as by instruction in the nature of the things he is afraid of; erotic curiosity should be kept away from the child by a sufficiently early explanation of sexual relations; coarse passions must be combated by work and the cultivation of the social ideal, by regard for human personality, especially for the weaker sex, and by personal abstinence from intoxicants. Unfortunately the born feeling-idiot learns altogether too easily to simulate feelings with words and to deceive those about him in that way. This is an imminent

peril which can be avoided only by much circumspection and insight, and here with the worst natures all education is a failure. In the sphere of will, which is perhaps the most difficult to influence through education, one should seek to replace moods and caprice by practice in the consistent carrying out of resolutions. In this respect the English are the best teachers: To learn to help one's self in life through fighting and work is the proper maxim for educating the will.

2. *Nerve Hygiene of the School; the School of the Future.* In the matter of eyes, ventilation, rooms, and desks, school hygiene has already made great strides. But when it comes to education of the feelings and the will, and to methods of instruction, up to the present the need for cramming the growing encyclopædia of human knowedge into the brain of the child, which unfortunately has by no means kept pace with it in growth [1] has blocked the execution of all the proposals and programs for reform on almost every side, however beautiful they look on paper. Only in the most recent times have the earlier impulses of a Rousseau or a Pestalozzi been realised in what are called the country training homes (Landerziehungsheime) and at the same time adapted to modern culture. The following sketch of what seems to me the most successful of the reform schools I take from an article which I myself contributed to the *Neues Wiener Tagblatt.*

The most modern school reform has its roots in the

[1] See Chapter V.

ideas of Rousseau and Pestalozzi; which could not be carried out successfully at an earlier time because the world was not yet ready for them and because Pestalozzi had no sense of practical order.

The latest school of the sort is the Swiss country education home, Schloss Glarisegg, near Steckborn on Lake Constance—an excellent situation in the midst of woods and fields.[1] It was opened with ten- and thirteen-year old pupils and will gradually extend the program to that of a gymnasium [roughly equivalent to an American high school, since it fits for the university, though the work really includes about the first two years of an American college], in order to give the pupils an introduction to the higher studies if they wish it, but its great object is to make men out of them in the best sense of the word, so far as their character and capacities allow it.

[1] The program of the school has appeared under the title *Landerziehungsheime Schulprogramm des Schweizerischen Landerziehungsheims Schloss Glarisegg*, published by Albert Müller, Zürich, 1902, and explains in about eighty pages, with illustrations, the principles of the school and how they are carried out. The program is divided as follows:

A. History of the country education homes; (1) Rousseau's pedagogical ideas and the country education homes; (2) the new school in Abbotsholme; (3) the German country education homes at Ilsenburg and in Haubinda.

B. Life and learning in the Swiss country education home: (1) Castle Glarisegg; (2) physical education; (3) scientific instruction; (4) art, religion, and morals.

See also: *Landerziehungsheime, Darstellung und Kritik einer modernen Reformschule, Inauguraldissertation von Wilhelm Frei* (Philosophische Facultät Zürich), 1902. Klinkhardt, Leipzig.

In the German country training home at Haubinda I had an opportunity to observe the total transformation of a pupil whose brain had been completely stupefied, benumbed, and discouraged by the cramming system of our gymnasia. In spite of all his work and effort, he saw himself an "incapable pupil" with the sure prospect of failing at the examination. In a year he was one of the best pupils in Haubinda; for he was not stupid, but only slow and deliberate and could not learn easily by heart. I learned then of a whole set of such cases, visited the school at Haubinda myself, and think therefore that I have a right to say something about it from my own standpoint.

The aim of every school should be to develop the understanding, the feelings, and the will harmoniously and wisely, so far as each individual brain is capable of such development. It should make useful, good, and active men and women who carry their struggle for existence through easily because they demand very little from others but produce much themselves for human society. Nobody can live nowadays without receiving material or spiritual gifts from his fellows; and a good citizen is the one who gives more to his fatherland and mankind than he gets from them, while a bad citizen does the opposite. The school must therefore do as much to cultivate feeling and will as to equip the child with knowledge and faculty.

But now for a long time the sum of human knowledge has been increasing frightfully; yet, as we have

seen, our brains are not perceptibly larger or better than they were two thousand years ago. It is therefore foolish to try and cram into them an ever-increasing number of facts and formulas of every sort. That cannot possibly be done without injuring the judgment, the emotional tone, the will, the creative fancy, and all the characteristics on which harmony of soul depends. The brain force must be reserved for judgment, reflection, understanding, and correlation as well as for feeling. *The dry facts and figures of the encyclopædias do not belong in our brain as a kind of mnemonic ballast, but in pigeonholes and libraries where we can consult them when we need them.* That is why tables and lexicons exist—not to be learned by heart. We must at last leave off torturing and maltreating children's brains in this way. Such a thing might have been in place two thousand years ago when there was no printing and the sum of human knowledge was still very small, but now it is generally soulless, detached morsels which are stuffed into the school books and have to be crammed by the pupil, and they give him indigestion instead of awakening love and understanding for the subjects taught. This is true also of the colleges and professional schools, which are no less needing of reform.

If you wish to develop a child's brain usefully you must place yourself at his service as friend and comrade, and study him exactly. Discipline should not be attained through punishment, but through love and reason. The child also possesses both of these in

his own way, and they must be respected instead of being loftily disregarded. It is far less the duty of the child to accommodate himself to the school than the duty of the school and the teacher to accommodate themselves to childhood. The teacher should therefore be a good pedagogue, a good psychologist, and a good man, but not a pedantic, self-conceited polyhistor. Pestalozzi's administrative incapacity in no way injures the deep truth of his perceptions. Every teacher should appropriate his spirit, absorb the psychology and physiology of the child, live the life of his pupils, think with them, and make a living whole of his knowledge. Only in such an atmosphere, with the feeling of physical and mental freedom, can the child harmoniously develop his judgment, his understanding, his ethical and æsthetic feelings, his personal and social will.

To attain this the ministries of education and the teaching body must first of all be made to face in another direction. The material situation, the intellectual and ethical *niveau*, and the social position of the teachers must be raised. The human worth of our children is identical with the worth of the nation in the next generation and certainly deserves such efforts and pecuniary sacrifices. I am bold enough to assert that this question is far more important for the future of the peoples than the fiscal question, the army budget, and the like, which keep our governments so very busy.

Is it not then a daily occurrence to see many of

those heroes of the gymnasia with their powers of memory and receptivity, those wonders of talent, the favourites of their teachers whose soulless echoes they are, dry up and fail in later life? I myself have seen an idiot whom I afterwards had to have put under a guardian but who, thanks to his memory and his quick, parrot-like receptivity had passed a brilliant leaving examination in a German gymnasium! On the other hand, we often see capable, thoughtful people, or even geniuses, so pestered and impeded by the methods of our gymnasia that they fail at the examinations and are lost to the élite of the nation unless money or great energy enables them to advance themselves in other ways.

The Greeks no doubt were a gifted people, and our culture rests on a Latin foundation; but the way in which our children are tortured with the pedantic details of a dry Greek grammar retailed from the books scarcely breathes into them the Greek spirit. If Aristophanes could only see it he would find a glorious theme for his sarcasm!

In the year 1898, the newspaper *Die Waage* instituted an inquiry into the results attained in the gymnasia and Realschulen [both secondary schools] as well as into the possibility of reform. The result seems to have been more oratorical than real. In the course of the inquiry one speaker suggested that the pupils without talent should be taken out of the schools; to which a lady replied that she found the question very difficult and worth going into more

deeply and asked the speaker exactly what he meant. This drew the remark from a professor that her uneasiness was not justified; it was easy enough to decide whether a child had talent or not! Does the professor really believe that it is so easy for a schoolmaster to play prophet and calculate a child's mind for the future? Who then will look after the selection of the capable brains in our present school system where success still depends pre-eminently upon memory and upon the faculty of quick apprehension, that is to say, upon very subordinate mental faculties, while very little account is taken of the higher talent of keen judgment, and practically none whatever of the combining creative power of genius? It is greatly to be feared that the idiot we spoke of would be left in the gymnasium and many pupils of talent and genius put out. To be sure, I do not know the Austrian gymnasia; but the system of examinations is pretty much the same in most countries!

But are our demands the utopian dreams of idealists, as has often been said of Pestalozzi and Rousseau, or can they be realised? Now we can say with satisfaction that they are realised already.

The first modern model school founded in accordance with the fundamental principles of a rational pedagogy is the work of Dr. Reddie in Abbotsholme, England. A German teacher, Dr. Lietz from Rügen, a genuine self-made man, who had studied theology in Berlin and at the same time had worked his parents' property as a farmer in the holidays, came to

Abbotsholme as teacher of German, improved the instruction there, and in April, 1898, founded an Abbotsholme after his own ideas in Ilsenburg in the Hartz Mountains.

As a member of the Berlin Anti-Alcohol League he had learned in his own person the advantages of total abstinence and introduced it as a principal rule in his school. He called his school the German Country Training Home (*Deutsches Landerziehungsheim*), and teachers and pupils regarded themselves as citizens of the school state. In this way, Dr. Lietz wanted to establish the idea of a community of work between teachers and pupils from the very beginning and to remove every barrier that might separate them.

The most important practical principles of the home are as follows:

A busy and regular life from the time the pupils get up in the morning until they go to bed; physical work and exercises together with mental, ethical, and æsthetic work. Freedom, responsibility, and co-operation of the pupil in the whole organisation and discipline of the school. Voluntary study quickened by competition. Frequent trips, always connected with interesting instruction. No examinations. Rich, wholesome food and sufficient sleep. Progressive hardening against cold, bad weather, and strains by means of daily systematic training in very different kinds of bodily work, which, however, all have a practical value. Daily artistic exercises, such as modelling and drawing from nature, singing and

playing, and the study of works of art. The cultivation of general religious, ethical, and patriotic feelings on every solemn occasion in the open air or the woods and on historical and scientific anniversaries which are celebrated with the aid of art and poetry. The removal of all external compulsions and all punishments and rewards which do not result naturally from the very nature of the fault or the accomplished work in question.

The scientific instruction is in accordance with the laws of pedagogics and seeks to arouse the attention and interest of the pupil through sense-perception and practical activity. He is taught to observe, to think, to judge, and to compare exactly and logically. The instruction in languages is carried on through conversations, exercises, readings, free compositions, and songs in the language to be learned. Everything that bores and disgusts is banished completely from every class, especially dictata, extempore exercises, and impositions.

Wherever possible the instructor teaches in his mother tongue. They read works of genius and borrow from them all that stimulates to noble thoughts and unselfish deeds. By talks between teachers and pupils, the latter learn to speak and to discuss. By free compositions about the things discussed in the conversations they learn to express themselves in writing.

The walls of the home are decorated everywhere with works of art. A complete Froebel collection

serves for the object lessons along with nature, factories, workshops, trips, and walks.

The aim of the school, according to Dr. Lietz, is to make out of the pupils men of harmonious and independent character, sound and strong in body and mind, skilled and practical with their hands, apt in literature, science, and art, capable of thinking clearly and logically, warm in their feelings, strong and courageous in will.

After two years and a half, Ilsenburg was too small, and Dr. Lietz founded a second country education home for the middle classes in the baronial estate Haubinda in Streufdorf, Thuringia. He went there himself and left the direction of Ilsenburg to an extraordinarily capable co-worker, Dr. Winecke. Since the institution of the first school, now almost five years ago, the " school-citizens " of both the German country training homes have undertaken numerous trips, generally by wheel, sleeping under canvas or in the open air, visiting cities, towns, and factories, and using all for their instruction. Thus a visit was made to the school in Abbotsholme, England, another to the Paris Exposition, and a third to Switzerland. Now all the classes of the Realschulen and Obergymnasien are organised for pupils of from eight to nineteen. The army examination (Einjährig-Freiwilligen-Examen) has already been taken with good results by the pupils at Haubinda. In this school alone there were already more than a hundred pupils and fourteen or fifteen teachers in 1902. The

pupils take part in all the work, have made earth-works and dug swimming basins in Haubinda, carry on gardening, agriculture, cabinet-making, and locksmith's work, and to a large extent write the school reports themselves and the accounts to trips which are incorporated in them. When I went to visit Haubinda I found Dr. Lietz and his pupils in the field, clothed only in straw hats, knee-breeches and sandals, busy with the vegetable crop. Football is played in a similar costume. All of the pupils acquire a handicraft. Each one is given a plot of ground which he cultivates as he will and whose products belong to him. The food is rich and excellent and the time admirably arranged in this school state with its ways at once patriarchal and fraternal.

The periods for instruction last forty-five minutes, with an interval of fifteen minutes between them; and in them a joyous competition between pupils and teacher reigns, each working with pleasure and interest, and trying through pure rivalry to work as fast and as well as he can. But he is not compelled to; for external compulsion is unknown. Instruction proper lasts from 6 to 11 A.M., the physical work from 2 to 4 P.M.; and from 4 to 5.30 the pupils do their exercises under the supervision of an older pupil, the prefect, but are at liberty to help each other. If they have not been able to finish their exercises in this time they are neither punished nor blamed and do not have to do them over again; but no one wants to be behind, and the brighter ones help the less gifted. That is

the spirit that Dr. Lietz spreads amongst the pupils of his home; and any one who seeks to introduce the spirit of egoism, of ridicule, of blackguardism stands in the pillory of general contempt, and instead of becoming a ringleader is sent to Coventry. A sixteen-year old boy said to Mr. Ferrière of Geneva: "We have no bad thoughts here, we think of other things, and then in the evening we are too tired and are glad to go to bed and sleep."

This fatigue however is a healthy fatigue, and the mental and physical appearance of the pupils is remarkably good.

It is amusing to watch the pupils during their free hours (*e. g.*, between 11 and 12). There is neither monotonous boredom nor crowds gathered to carry out boyish pranks. One bathes, another is stretched on the grass reading, a third is walking and discussing something with a chum, a fourth is riding his wheel, another is asking his teacher this or that, while others are working in their garden or their shop. This independence and lack of compulsion make a rare impression of well-being. As for Dr. Lietz himself he was indefatigable everywhere, in work on the buildings, in his recitations, in the hay-field, in foot-ball, taking a hand himself everywhere. He bothers himself very little about drawing-room manners and so-called bon-ton, but takes all the more interest in the true heart-qualities of his pupils, their uprightness, their spirit of kindness and accommodation, their morals, and their social sympathy.

Peaceful and interesting is the evening service. At it there are always readings from gifted authors whose words lift up the soul. Under the great oaks of the estate the pupils thoughtfully assemble. Charming parables suited to the situation, clear, ethically effective and impressive passages from the Bible or the wisdom of the ancients are chosen and properly applied. The ideal atmosphere which permeates the institution is one of individualism harmoniously blended with altruism and social solidarity.

The school in Glarisegg was founded by Dr. W. Frei and Mr. Werner Zuberbühler, both pupils of Dr. Lietz, and opened in the spring of 1902. After only a year there were forty pupils. During the last summer vacation I had the pleasure of being visited by some of them; they had wheeled through the Swiss mountains. Each had a part of the tent buttoned to his wheel and when it was all put together it served as a lodging-house throughout the whole trip. It was also set up in front of our house. Sunburnt, jolly, and in famous condition the boys spent two days with us and showed a great interest in the objects of natural science which I showed them.

In the Swiss country education home of Glarisegg the work is quite similar to that in Ilsenburg-Haubinda. Every study hour lasts forty-five minutes. The following table shows how the time is divided:

Science and Art	Manual Labour	Free Times, Intervals and Play	Meal Times	Sleep
Instruction 225 minutes	Garden 55 minutes	Short pauses 85 minutes	Meal time 90 minutes	Night's rest 9 hours 30 minutes
Study 45 minutes	Workshop 55 minutes	Free 180 minutes		
General meeting (worship) 30 minutes	Housework 60 minutes	Common games and gymnastics 45 minutes		
5 hours	2 hours 50 minutes	5 hours 10 minutes	1 hour 30 minutes	9 hours 30 minutes

In the matter of scholarship the results of the country training homes are capital. What we learn with pleasure and interest stays in the brain much better than what is crammed in by force with disgust and tedium in a desperate fight against other thoughts and distraction. The constant pressure and anxiety produced by our pedantic, dry, one-sided, and unpsychological method of instruction, with its penalties, pensums, examinations, and overloading of the memory without sufficient understanding, detract from the pleasure and the spontaneous interest which are the conditions of intelligent learning. Granted that in many schools progress has been won in the directions indicated, yet it is still very unsatisfactory and partial. Even the teachers who would like to make a reform are hindered by fixed programs and

prescriptions. The banishing of all alcoholic drinks from the English, German, and Swiss country home schools forms in any case an important factor of their success: heads always clear, consistent sobriety, training the full force of nerve and muscle and making the most of them without any reduction through alcohol.[1]

A country training home for girls has been founded by Frau v. Petersenn on Lake Stolpe (Stolpersee) near Berlin and has succeeded quite as well as those for boys. A branch for older girls has now been founded near Radolfzell on Lake Constance. Girls have claims as well as boys to a sound and natural education. For the rest, the opinion is continually gaining ground that a common education of the two sexes is the best morally and in every other way. It is therefore to be hoped that with time the country training homes will carry out this principle.

Up to the present time, the country training homes are private schools; yet the cantonal government of Thurgau manifests a great friendly interest in Glarisegg. How far the State institutions will be able to adopt the advanced position is not yet clear. Yet I am fully persuaded that with good intentions many of the principles of the school state (without the boarding feature) might be introduced into the state schools, though of course they would need a more rural location. In the town schools it would go very well, according to my ideas, if they would give

[1] The programs of the German country training homes (*Landerziehungsheime*) are to be had from Ferd. Dümmler's bookshop in Berlin.

the schoolmaster an assistant for the manual work.

The country training homes should prepare their pupils for the technical schools as well as for the universities. A few difficulties, especially with reference to the ancient languages, with whose forms our gymnasia and leaving examinations are still overburdened, would still have to be overcome. Herr Lietz, however, has already founded a third *Landerziehungsheim* for the higher classes in Castle Bieberstein near Fulda and several of his pupils have now taken the leaving examination (Maturität) with the best results. But the results already attained give us a right to the fairest hopes. There is agitation everywhere and the purifying air of the country training homes comes like the liberation of our youth from a mental and spiritual strait-jacket. May that breath of freedom soon blow away the old routine, and above all may we devote all our attention to the *education of the teacher* in the new spirit.

3. *Nerve Hygiene of the Home and the Family.* For reasons already explained this is a bad subject, because preaching does no good, since parents of bad disposition will always be bad educators. A great deal is said about the beauty and goodness of family life, but the ideal which that implies is unfortunately seldom realised. While actually, perhaps in the majority of families, odious quarrels of the parents, lies, vanity, selfishness, irritated moods, and humours compete with foolish affection, overindulgence, lack of judgment, and superstition to give the children

the worst example and the worst habits from the earliest youth; it is not so seldom that we find a directly criminal selfishness which tries to gain money in most scandalous ways by the exploitation of inconvenient children, and which systematically trains them in begging, stealing, or lying, or, in the worst cases, even attempts to torture them to a lingering death and get rid of them by systematic maltreatment, by the refined cultivation of diseases, and even by starvation. Such a misuse of the power, far too great, which our laws give parents over helpless children, is due not only to the wish to get rid of a child that it costs too much to feed and clothe and care for, but also to feelings of the baser sort such as jealousy and false shame. Of this latter the chief victims are illegitimate children; of the former, step-children. We must therefore agree completely with the founder of the society for the protection and rescue of children, and of the whole work of protection and rescue in Vienna, Fräulein Lydia v. Wolfring, when she demands a much greater limitation of the parental power and its complete abjudication in more serious cases.[1] The so-called better circles of society are not acquainted with this sink of moral depravity and pass indifferently by; and I advise any one who takes the "sanctity of family life" seriously to get in closer touch with the question, to study the family life of the criminal proletariat, and to read the works of Fräulein v. Wolfring,

[1] *Die Aberkennung der väterlichen Gewalt*, Vienna, 1902, and other works by the same author.

the novel of Walter Biolley, *L'Apaisement*,[1] or some other similar work, and many other pictures by modern social reformers. These pictures are not exaggerated; they portray conditions which cry aloud for redress. We have given the parents a power over their children which is by far too uncontrolled, and its exercise is mostly a matter of whim and interest rather than of love and reason. We should certainly try to counteract bad home-influences in the school; and to do this successfully, the school should be transformed according to the principles of the country training home. And what should parents do? First of all, observe their children and love them and bring them up with reference to their later future. If they discover good and sturdy qualities they must develop them further and combat the bad ones. But this latter can not be done successfully by scoldings, injudiciously repeated punishments, and accusations and complaints, such as are usual with parents. Every one knows that irritated accusations always repeated in the same tone remain absolutely ineffective and only provoke contradiction; so that the time gradually comes when there is never an end of little angry words and the replies they provoke; irritated speeches and rejoinders are automatically repeated in the same tone at every opportunity; and finally a permanent habit of quarrelling grows up between parents and children which kills good feeling, so that the result of it all is the exact opposite of what the

[1] Published by Dubois in La Chaux-de-fonds, Switzerland.

parents intended. The parents should therefore watch themselves and never threaten unless they are able and willing to carry out their threats, and never punish and scold ineffectually, but rather let the child teach himself from the evil consequences that spring spontaneously from the very nature of his faults. To be gentle and loving in speech, to be strong, consistent, and mild in the treatment of the child, and above all, always to set a good example, are the great things in education or training. Lies should be carefully combated as well as coarseness of sentiment and selfishness. We should work more through the stimulation of good feelings, of sympathy, self-sacrifice, magnanimity, than by blaming the bad. True love does not flatter or foster a child's vanity. The child must be trained to work, but in his own interest, and not for exploitation, as so often happens. Superstition, mysticism, alarming legends and stories of robbers must be carefully avoided. The child should neither be kept in constant fear nor be made to obey through fear; it should never be deceived and should be able to count on the truthfulness of its parents with absolute security. It must not be always kept in ignorance of the dangers and wickednesses of the world, but only learn to abhor them. On the one side we must carefully seek to avoid emotional wounds [1] which are easily made through fright, wickedness, sexual attempts, and the like; and on the other we must systematically train the feelings of the child

[1] See Chapter VIII.

against supersensitiveness and fearfulness by calmly accustoming him to things. A special danger lies in mental infection and bad suggestions.[1] On that account a general supervision of the children's surroundings and intercourse is necessary, so that they shall not succumb to bad influences. For similar reasons it is necessary to give them a rational knowledge of sexual relations in good season, for anxiety and shame in connection with erotic feelings and an unhealthy curiosity tend to injure the child's emotional tone. Moreover we must look out for sexual abnormalities, especially for habits of self-pollution, which so often result from bad example or corruption by other children. Phimosis (or adhesion of the foreskin) in the case of boys and pinworms (oxyuris vermiculosus) more especially with girls also tend to cause this and must be removed, the former by an operation. All morbid stimulations of the nervous system, and especially of the feelings, must be avoided, a matter which is excellently cared for in the system of the country training homes. As for young men and the temptations with which they are confronted, we must remember that hard work and high ideals both make for purity, and so long as they behave themselves they need not worry about phenomena that are perfectly natural.

We believe it is a duty to children to avoid one-sided dogmatic teaching and "pious lies." In matters of religious and metaphysical belief the child

[1] See Chapter VIII.

should become familiar with all the different views and *actually* feel perfectly free to decide for himself.

It is moreover a high duty of education to combat prejudices and belief in authorities, as well as all luxury and everything that complicates life unnecessarily. Altogether too quickly the young children, especially the girls, ape the trumpery and the silly fashions of their elders in clothing and customs. This overvaluation of external and often foolish forms smothers the ideal, while the aim of a proper education should be the cultivation of this very ideal element. Moreover, if people were only simpler and willing to live according to the principles laid down in this book they could marry earlier and avoid many a temptation and difficulty.

After all that has been said we need hardly repeat that besides fresh air, free movement, and appropriate food, constant regard for the law of exercise forms the foundation of positive nervous hygiene and brain training far more in childhood than at any other age. We therefore conclude this section by referring once more to Chapters VIII. and IX.

In the case of morbid tendencies and bad habits, as well as with functional nervous abnormalities in general, hypnotic suggestion can affect children very favourably; though of course it cannot alter the inherited tendencies, but only combat their consequences to some extent. Yet it is a sovereign remedy with acquired bad habits.

The child must be trained to independence in life's

struggle, his nervous system must be constantly strengthened accordingly, and his capacities brought to the most manifold development possible.

Perhaps it is in place here to appeal to the good sense of all people, especially of all fathers and mothers, that they should at last get rid of the superstitious belief in secret remedies and so-called "cure systems" which are supposed to cure all diseases. All remedies and systems of cures which are puffed in advertisements can be characterised as highly suspicious, and those advertised in the daily papers are almost certainly swindles. If anything has a real value medicine knew about it long ago. There can be no general system of cure for all diseases, because each one of them is somewhat different from every other. A disease must first be exactly investigated and recognised before we set out to cure it. Physicians are often tempted to swindle by the unreasonableness of the sick, who are often afraid of the only measures (such as operations) which can help them and insist throughout on visible and tangible medicine—with a nice taste. It is thus the public that trains many physicians in quackery. But the great thing for the patient is to assure himself of the capacity and conscientiousness of the physician that he consults. And now people are prating of a natural healing art and natural methods, as though the whole science of medicine had any other aim than the art of healing by finding out the *nature* of diseases. The name "natural system of healing" is only a mask for crass ignorance if not for humbug.

CHAPTER XII

SPECIAL NERVE HYGIENE FOR ADULTS

1. *General.* This chapter can be greatly abbreviated from the fact that we have already become acquainted in Chapter VIII. with the causes of mental and nervous disturbances which we have to combat, in Chapter IX. with the general foundations of nervous hygiene, and in Chapters X. and XI. with the preconditions necessary for the development of the best possible nervous health. What we said about this in the last chapter also holds as a general principle for adults in the further struggle of life.

When a young man's growth and studies are finished life stands before him.

Unfortunately nowadays a one-sided education which aims at pleasure-seeking, money-getting, and selfishness, and perhaps also includes too close an acquaintance with alcohol and venereal diseases, gives our young men an early training in place-hunting and philistinism, and does it so thoroughly that in by far the great majority of cases every sound and noble ideal of life is killed. Is it much better with the young girls? The old education of solid, reliable girls to modesty and capable, diligent housework is

not completed, as it should have been, by a more liberal and thorough mental training which might have led to a rational broadening of their horizon; it is replaced on the one side by a superficial, disconnected smattering of many things, and on the other by frivolous vanity, luxury, and pleasure-seeking. The great aim of life with our modern young girls seems to be to make a " good match." The competition of both the sexes in this respect leads to a sordid bartering, of which true love and true married happiness are often the victims. For this reason, the educational reform of the country training homes is to be hailed as a true godsend for the nervous health and the life-happiness of the growing generation. Yet still worse is the state of affairs with the proletariat, as is shown by the demoralisation of family life and children's training already depicted in a previous chapter.[1]

[1] As early as 1892 I wrote the following, amongst other things, in the *International Monthly for the Combating of Drinking Customs* and in the *Swiss Family Weekly* (*Schweizerisches Familien-Wochenblatt*) under the title " Nerve Hygiene and Happiness " :

" ' Too many nerves, too little nerve ,' Professor Krafft-Ebing has said of our modern generation.

" When a man and woman are in love and wish to be united for life they should never forget that in so doing they assume great responsibilities—for their future children. They should rather renounce marriage, or at least the having of children, than engender physical, or worse still, mental weaklings. But unfortunately nowadays we find noble natures, people of better and higher tendencies, anxiously exaggerate these considerations and avoid marriage or the having of children on that account, while, on the contrary, the most addle-pated, brutal, and stupid of people breed almost like rabbits, under the protection of laws that rest on a mistaken humanitarianism, and then conveniently leave

To be really happy a person (*i. e.*, his brain) must first of all be and remain healthy; in the second place, he must go through the life history traced out for him by ontogeny; and in the third place he must have an ideal, or strive for something higher. The advocate of nervous hygiene has a right to demand that so far as the requirements of an earthly human ideal are concerned the orthodox should unite forces with agnostics, freethinkers, and monists to attain a better state of society.

What are the higher forces that can give the human spirit courage to strive upward and keep its lower passions and its love of pleasure in check? They are first of all firm hope for a better future of our race, *i. e.*, of the descendants, the children, the better part of the self, that will live on in them. Then in the second place there is joy in the good deed done, the difficulty overcome, the progressive knowledge of nature and its secrets, the fine, high harmony of art and its creations. Every one who contributes his

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the progeny to the State or to public institutions, generally after they have made their original bad tendencies still worse by alcoholic excesses. And with this mismanagement, this reversed selection, people still wonder at the increase of mental diseases, of lunatic asylums, of a stupefied proletariat, of morally defective vagrants and criminals! We speak of overwork as the cause of the trouble, and overlook the fact that the greater part of this spiritual proletariat has never overworked, but only become more and more useless and lazy; and that the 'nervousness' which really arises from overwork forms only a small and relatively harmless drop in the bucket, while the endless crowds of mental shipwrecks almost always owe their calamity to morbid or bad cerebral tendencies, to licentiousness, and in an enormous percent of cases to alcohol."

brick (be it large or small) to the building of our human culture whether it be in the sphere of science, of social ethics, or of art, will find his reward in the satisfying feeling that he has helped to realise the ideal towards which he strives and which should hover before every one. The great blunder of many is the overstrained demand for everything in life or nothing, the tendency to give up at once and hold that life is not worth living just because one cannot do or attain everything, and consequently to fall gradually into pessimism or selfish debauchery. Of course, I am speaking here only of those whose brains are able to rise above the monotony of a thoughtless animal existence.

We have seen in Chapter XI. that a proper, happy, and healthy brain-development should include constant and many-sided mental and bodily work and one or more specialties. To this there should be added also an ideal aim in life, which may consist of scientific investigation, artistic creation, works of social and ethical betterment, or educational efforts. Work in service of the ideal is fundamentally different from the work of breadwinning because of its disinterestedness. I have said elsewhere that Knowledge is a fair creature who wishes to be loved for her own sake and whose culture for mere gain is little better than a sterile prostitution. This is true of every aim in life, however ideal it may have been in itself to begin with, when it becomes associated with sordid place-hunting and even grows at last into a leading motive

of trade. Thus the social battle against mammon makes a great indirect contribution to the improvement of our nerve hygiene.

If we have given our life an aim by the choice of a sound and true ideal we must not let that make us forget the first two conditions of happiness, our health and the fulfilment of our natural evolution. This latter includes love between the sexes and the founding of a family. Marriages between those who are not fitted to each other are sorry alliances, and people should know each other well before they take the step. But the worst thing for a marriage is the previous selfish calculations of the two; two egoists clash with each other and deceive each other, and war is declared—unless the pair enter into a selfish partnership to the injury of the rest of society. When marriage is entered into by two reasonably normal people, *i. e.*, two who are not generally incapable of leading a useful life through irritability, freakishness, trickiness, alcoholism, laziness, pleasure-seeking, and extravagance, they should lay down for themselves the following fundamental principle:

Marriage demands a double task; but it gives us the strength for it. In marriage each should set out with the principle to give and not take, to bear all things for the happiness of the union, and never to exploit the other, but through daily love and sacrifice to see in him or her a treasure for which we gladly do everything and give up everything, which we tend and cherish from pure joy, as we would tend a beau-

tiful plant that we love. If each is true to the other and both preserve this principle, they will never be angry with each other very long, but quickly forgive, the happiness of marriage will not be lacking, and they will find on earth the paradise of our dreams. People have a way of speaking ill of marriage nowadays, because they see it so often prostituted and because so many pathological and selfish people of various sorts transform it into a hell. But it is not so difficult for the two to see each other in something of an ideal light if they have good will and if each is good and sound at bottom. This by no means prevents one of them from training or educating the other; mutual, elevating, lasting love certainly does not need to degenerate into unworthy weakness or untruthfulness any more than the good and loving training of children is equivalent to foolish idolising and spoiling. To increase and refine married happiness, each should incite the other to work and to social and ethical tasks, and they should give themselves a common ethical training, instead of abiding narrowly and exclusively in their mutual life. If a married couple feel themselves to be a pair of social labourers the death of the one will not destroy the other's joy of working. And in the same way good care for the children gives added refinement and elevation to the happiness of marriage. Yet the child must be brought up to be a useful and diligent member of the community. If deep defects of character or irreconcilable differences dominate the marriage

its dissolution should be sufficiently facilitated to make it possible to put an end to such married hells. By care for the earning of a living, the fulfilment of the many duties which marriage and all that it involves lays upon people, and the pursuit of a proper ideal of life in any direction—we mean the practical pursuit of an ideal by work, and not dreams about it—a person's brain-life receives an appropriate content and under normal circumstances can give him the life happiness that he desires; then he can die in peace and contentment.

We have still to discuss *nervous health.* This indeed is furthered most of all by the fulfilment of the two great conditions, negative and positive, already mentioned; and that is something which most people are unfortunately unwilling to realise. But of course we must admit that in spite of the avoidance of all poisons and excesses and in spite of all one's efforts to live according to the rules of a sound brain hygiene, emotional conflicts and wounds, discouragements, unhappiness, and tribulations of all sorts cannot be kept out of human life, and oppose themselves to a happy development of our brain and nervous action. Hence a few special rules of hygiene must be added to the more general ones already given.

We must simply try to force ourselves to optimism; not a stupid, undiscerning optimism which overlooks all that is bad and abortive and in that way makes false calculations for the future, but the healthy,

buoyant optimism that we find in these lines from the well-known operetta *Die Fledermaus:*

> "Glücklich ist,
> Wer vergist,
> Was nicht mehr zu ändern ist." [1]

The past is a hard crystal in which we can no longer alter anything; only the future is plastic and can be partly predicted and prepared for. To be sure, the past should not be forgotten in the sense that we are unwilling to learn from it. On the contrary, it should be the teacher for the future. But woe to the man who wastes his existence in brooding and despondency and lamentation over past misfortunes and past mistakes. A great sponge must be rubbed over this sterile "life for the dead," over this barren mourning and grieving. If we look closely we soon discover that, apart from pathological tendencies, this idle lamentation and despair over lost happiness often finds its roots in narrow-heartedness and the selfish limitation of our love to a few chosen objects. Because the *exclusive* love of a mother for her son or a wife for her husband has left no room in her brain for broader ideals, life, happiness, and brain die out for her with his death or ruin. With others the beloved object is a sack of gold; with still others the glitter of external position, and so on. Then let the steady compass of our unswerving optimism be: Ever forward to a large-hearted ideal; never look back!

[1] ["He is happy who forgets what no longer can be helped." Compare the motto: There are two things we must not worry about—what we can help and what we can't help.—TR.]

And we must not fall in love with our own past work. This also should serve only as a library for future work. I cannot insist enough upon the importance of this rule of life, which is a rule both of hygiene and of ethics, but one against which we sin continually and grievously. If you have been guilty of a fault or a stupidity, rectify it as soon as possible, make everything good that can be made good, avoid the repetition in the future, and for the rest lay the matter forever "ad acta." We should do the same with the faults of others. To be sure, it is not such an easy matter with the faults that are so bound up with a person's character that he cannot lay them aside. At such faults one must constantly labour, and often erect regular walls of stone to protect himself and his fellowmen from the consequences of relapses.

A further rule of nerve hygiene is to pay as little attention as possible to functional nervous troubles and disturbances, so as not to cultivate them by habit. Any one with the unhappy tendency to pay constant anxious attention to his health and every annoying feeling, who continually feels himself sick, notices his pulse and doctors himself, is a hypochondriac, and hypochondria is a snowball that continually grows as it rolls. If the hypochondria is deeply inbred it is simply incurable and the patient falls a prey to the avarice of every quack and other medical swindler. Inactive, well-to-do people through constant and injurious "cures," unnecessary precautions, and fear

of bacteria, often cultivate a hypochondria which could have been easily avoided by a healthy mode of life such as that of the country training homes. Indeed, as we have already seen, painful frailties already present can often be greatly relieved or even removed if the attention is withdrawn by means of work. Thus we must do our best to ignore all functional nervous troubles in order to turn back the neurokym as far as possible into a normal path. Moreover we have already seen that the person on whom great claims are made by his calling should use his free time as much as possible to round out his life harmoniously by activity in other fields. No doubt many people reply that this is impossible; they have no time. But this is generally because these people are bent with all their force on getting rich quickly and prefer the chasing of dollars to their true happiness and their nervous health. But what do they get from it if they die rich and have brought up their children as useless fops, who disdain work in the prospect of a great inheritance, overestimate themselves, and think that they are a bit better than their fellowmen, while they are really only injurious parasites on society? I know that this is a mere commonplace, for what I have said here is what every one is saying nowadays; but unfortunately that does not prevent people from practising the very opposite of what they preach. One should therefore make it his consistent aim to reserve his evenings and Sundays and holidays, not for laziness and beer-drinking, but

for cultivation in other directions, for trips and cycling tours, mountain climbing, and the like. A beautiful mountain trip, a student expedition with a good many bodily hardships, a more extended bicycle tour through different countries, are better cures for the brain and nervous system than the stays so common nowadays in "cure" places where a useless drawing-room life is carried on with accompaniments of beer-drinking (*Kneiperei*) and flirtation.

For the rest, I shall not repeat here what I have already said in Chapter IX. about sleep and the necessary normal restoration of the nervous system as well as about harmony and choice. Sleep means rest for the brain, and is indispensable for its health.

2. *The Nervous Hygiene of Women* demands special consideration because certain periods of their life require extraordinary precautions in view of the special predisposition to nervous troubles caused by menstruation, pregnancy, confinement, and the climacteric. Yet after all if a woman will submit to work and a sound nerve hygiene in the same way as a man she will get through these periods of her life swimmingly and with very few or no disturbances; it is only with psychopaths that a certain special care is necessary. I refer here to what has been said already in Chapter X. about the having of children; for nervous hygiene demands a sufficient time for recovery between successive pregnancies. If a mother brings her children up properly (see Chapter XI.) it will contribute greatly to the protection of their nervous

health. It is very important to accustom even the very small children to strict and proper habits of sleep and cleanliness, and not to pamper them. This means a hygienic protection of the brain for both mother and child.

It is especially important to accent the injuriousness of certain kinds of fine hand-work which overstrain the attention and irritate the brain, especially long-continued sewing and similar sedentary occupations that strain the mind. The one-sided overdoing of such work makes many women nervous and psychopathic or exaggerates bad tendencies which are already present. Generally speaking the mental life of many women is worried out of them in the slavery of petty housework and childish vanities—deadening in themselves and bound up with all sorts of cares and vexations. In view of this it is extremely necessary that a woman's horizon should be broadened and she should be more highly educated so that at last she can free herself from continually attaching far too much importance to every little detail and thus neglecting what is higher and more important. Many mothers become irritable and quarrelsome or even directly melancholy and deranged as a result of such worries and one-sided abuse of their brains. The supposed and often real disagreeableness of the mother-in-law that we joke about so much, often has no other foundation; for otherwise higher interests would help her to overcome her petty jealousies. But the relaxation and change should not be found in

gossip or luxurious and frivolous pleasures, but in vigorous bodily exercise, higher mental cultivation, and social activity. This last point cannot be emphasised too much, for our women are fearfully difficult to tear out of their routine, even though in many cases this is the only way of curing them of their nervous abnormalities.

3. *The Unmarried and Childless.* The nerve hygiene of single people, old maids and bachelors, widows, widowers, and childless married people, deserves special appreciation. All these people are usually without a purpose in life. To some of them love is lacking, to others only the family, but they all have this in common that they are stunted by more or less exclusively selfish employment about their own selves and easily become eccentric in the worse sense of the word. When a woman has no children or other worthy objects of attachment and care, a characteristic love and attachment for a cat or a lapdog often develops by way of substitute. This well-known phenomenon plainly shows how much the human spirit, *i. e.*, the human brain, needs something to live for. The false selfishness of most of such hermits of both sexes revenges itself on their own person; for their stunted life makes them unhappy; and thus it is not altogether wrong to speak of a peculiar kind of madness with old maids and bachelors. But when we see on the other hand what these same "solitaries" can often accomplish in magnificent philanthropic or social works, in science or art, when they replace their

crotchets by a high ideal, then we must say that the cure lies very close at hand: *work for an ideal end.* No unmarried man or woman should neglect this if he does not want to sin against the hygiene of his own brain as well as against his fellow-men. In place of children he should contribute social work to society and thus lend an aim to his existence.

There is a well-known quarrel of long standing between the heads of families and those who are single or childless; the former reproaching the latter with their indolence and selfishness, while the latter reply: "We have had to renounce the happiness of marriage or of children, or we have done it freely for the sake of having our peace; and now we mean to enjoy it. You are responsible for your own troubles if your children turn out badly." Such selfish and quarrelsome ways of talking are vain and injurious to both parties. We do not demand of the free and single that they should kindly allow themselves to be exploited for the benefit of the criminal brood which bad parents heedlessly engender, and thus only increase their characteristic pessimism and cantankerousness. We simply ask for their own sakes as well as for society at large that they shall give up their sterile existence with all the harm that it does to their own brain life in exchange for appropriate social work and the pursuit of any useful ideal. The solidarity of human society demands it, and without it no life-happiness and no proper nerve hygiene is possible. In Chapter X. we have seen what limitations on the

one hand and what positive duties on the other are laid on individuals by social hygiene in the matter of having children. In Chapter XI. we have stated the requirements in the matter of bringing children up. In this work for the next generation the single and the childless should take part quite as well as those with plenty of children; for it is an extremely short-sighted and silly selfishness to try and care only for one's own progeny. When your own children grow up they come into relations, perhaps into marriage relations, with those of others; for all society is connected. This fundamental fact of human social life must be regarded as the foundation and starting point of all nerve hygiene, and only consideration for it can lend purpose and consequent happiness and satisfaction to the brains of those without family responsibilities. Here I should like to specially recommend the system of the Pestalozzi League in Vienna which provides families for reliable but childless married people. Upon payment of the expenses they are given a limited number of poor unfortunate children, boys and girls together, who had been maltreated or neglected by their parents, to bring up, under the supervision of the league. This system can be greatly spread for the good of mankind.

4. *Nervous Hygiene of Old Age.* The modern man wears himself out in restless earning in order that he shall be able to rest in old age. But when the man who has worked all the time gets old he discovers that without work he can no longer exist. Only the

idler and the pleasure-seeker who has squandered his life becomes even lazier than ever in his old age (if that is possible), because he has never exercised his neurones. If any one wants as happy an old age as possible, he must first of all never betray his optimism; second, never brood over the past and the dead; third, work away to the last breath, to keep as much of his cerebral elasticity as possible. The pessimistic, peevish discontent of so many selfish old men and women usually rests (when it is not pathological) on their inactivity. They want to sit down in peace, and instead of peace find discontent with the world and themselves. The quarrelsome grandmothers and mothers-in-law as well as the tyrannical old men who demand everything and do nothing, may trace their bad peculiarities, so far as they are acquired and not inherited, partly to changes in the brain that come on with age, but partly, as we have seen, to a petty, selfish stunting of their spirit and to the lack of an ideal end in life. They busy themselves in blaming and tormenting their children, grandchildren, children-in-law, and nephews, instead of using what is left of their powers in useful work. But the old man whose brain is still sound and who is not ashamed to keep on thinking and working rejoices, even in the evening of his life, in the world and people and the happiness of youth, and enjoys love and consideration, instead of being the object of aversion or ridicule. To be sure, when senile weakness sets in it often brings with it a morbid

vanity, and then the old man runs the risk of damaging his former reputation by inferior efforts. If he is sick and injudicious, one must take the necessary steps to protect him against himself, as is proper with one suffering from senile mental weakness. But if his brain is not ruined by alcohol and he is still capable of clear enough deliberation, he ought to be induced to exert himself in some way that can do no harm. If he is modest, he will find enough of such employments. For the reasons just named, a consistent muscular activity, so far as it is possible, is also to be strongly recommended to old people.

5. *Nervous Hygiene for Psychopaths or Neuropaths.* By these we mean those who belong more or less to the second group of Chapter VII. Their hygiene has already been discussed in a general way at the conclusion of Chapter IX. As we saw, there is no sharp line to be drawn between members of these groups and those whose central nervous system functions normally. It is often a mere matter of weakness, of inferiority, of too strong or too weak sensibility, of the tendency to lose heart, to premature exhaustion or fatigue, to pains and paræsthesias, or even to cramps, passionate outbreaks, impulsive acts, and the like. Slighter disturbances of this sort are so numerous that they are to be found in almost every human life; and thus it is difficult to draw a line here between hygiene and medicine. For conditions like these we can use the term " nerve fidgets " (Nervenzappel) in the purely popular sense; often, however,

things are reversed and it is a question of a paralysis or inhibition of the neurokym—of a " nerve laziness."

The facts already enumerated (in Chapter VIII.) as to the causes of the degeneration of civilised peoples on the one side, and the ever-increasing demands on the human brain (see Chapter V., Race History), which are always mercilessly exposing every inferiority, on the other, have created a social condition bordering on the intolerable. We have seen that the normal, phylogenetic side of this condition is to be traced back to the fact that our brain organisation can by no means follow the frantic progress of culture. No wonder if two such powerful factors (deterioration of the brain and increasing demands upon it) produce a frequent failure of brain powers! I believe we can trace back nervous fidgets and all constitutional psychopathias to a manifold combination of inherited deteriorations with the higher demands made upon the brain. How the causes of deterioration are to be combated we have seen already. But what is nervous hygiene to do for these nervous fidgets when they are already present?

In order to get in proper touch with our question, which is truly one of the most, if not the most, important of immediate nerve hygiene, we must bear in mind what has just been said, as well as our phylogeny or race history, and picture to ourselves the original conditions of life of a brain not yet degenerated, and above all not yet overworked and overdriven, as it was phylogenetically developed through

natural selection in the struggle for existence. In other words, we must place before our eyes the primitive man in the primeval forest, as, warring with wild beasts and other primitive men and constantly threatened by the elements, he was forced to fight every day for his life. To this end not only did his senses and his muscles have to be capitally developed (as we still find with savage peoples), but his brain had to be adapted for quick, agile movements, and the most perfect muscular innervation, as well as for a constant strained attention of the senses, and the combination of both. Now the history of the race and of the germ proves most indubitably that that primitive man still lives deeply lodged in our brains. There is nothing astonishing in this. To us short-lived people that prehistoric condition may well appear to be endlessly far back; yet for phylogenetic development the whole duration of our culture or world history, which separates the modern from the primitive man, means only a relatively short span of time hardly worth considering in comparison with the immense periods required (even on the theory of sudden mutations) for the phylogenetic or evolutionary transformation of one species of animal into another or the brain of a pithecanthrope into that of a man. But now psychopathic people in the main display a set of brain reactions which are insufficient or break down in face of the increased demands of culture.

From these considerations there follows an impera-

tive requirement for the hygiene of psychopaths,—the *return to a simpler mode of life, as similar as possible to that of primitive man.* To be sure it can be objected that this is only a theoretical hypothesis, however probable it may sound. To which we simply reply that practice confirms the supposition completely.

An immense field for experiment is afforded by the lunatic asylums, and experience has shown that agricultural labour and similar bodily activities have excellent curative effects for psychopaths and the chronically insane. We can even say it is the only thing that improves them and that in not a few cases it actually cures. We have already mentioned (in Chapter IX.) Herr Grohmann's employment institution for those with nervous diseases; and we have also become acquainted with the admirable results of the country training-homes. All these things confirm our thesis.

Obviously it is no longer possible for us nowadays to bring back the struggle for existence in the forest primeval, and we have already said that it would not be worth the effort; for the disadvantages of such a state far outweigh the advantages, and this is not necessary for the psychopath. It is sufficient to simplify his life as much as possible under the conditions that now obtain and to point out to him employments which depend upon sensory activities of the attention combined with muscular force. To this end we can even make use of the most modern

means, especially the bicycle, which is admirably adapted to it, since its use necessitates a constant attention and an exact co-ordination of movements. And the result is not lacking; the bicycle is an admirable remedy for psychopaths. The same is true of wood-chopping, agriculture, gardening, riding, hunting, and the like. These employments are extraordinarily well adapted to remove pathological storms or paralyses of neurokym, headaches, stomachaches, constipations, hysterical attacks, and other such nervous fidgets, by turning the neurokym into the paths of a vigorous, healthy, normal brain work. Appetite, sleep, and cheerfulness again return.

To be sure, the law of training must be followed here with double carefulness. In cases of serious exhaustion and severe pains other means, and especially hypnotic suggestion, must be used at first, and we must proceed extremely slowly and patiently and consistently to bring the neurokym on the right track and to keep it there through exercise and habit.

Evidently it makes a vast amount of difference whether we have to do with a mild transitory case of nervous fidgets or with one that is deeply chronic. With the former a short vacation " cure " with a few primitive-man exercises will remove the trouble, and its return in the future will be prevented by slight corrections in one's mode of life, especially by going to bed early, giving up any alcoholic indulgences, and working somewhat more physically and less mentally. In the case of deeper, more lasting psychopathies, on

the contrary, the whole mode of life and the calling must be changed for ever. But it is exceedingly important not to enter upon all these regulations according to a fixed program. Every separate case demands special treatment and it would be absurd to try and lead back all the psychopaths together to a sort of gorilla life. We have even seen how a positive cure can be brought about, especially in the case of hysteria, by the vision (engendered and fixed by suggestion) of a beautiful ideal in life which can be fulfilled through definite and perhaps even intense mental work. Such cases, even though they do belong to medicine, give a highly important hint for nervous hygiene in general. And this hint agrees completely with what we have said about the necessity of an ideal and the regimen of the country training-homes. While a simple return to the most primitive work of farm or garden is indicated in the case of psychopaths who are generally inferior; with those, on the other hand, who are only inferior and "fidgety" in one direction and perhaps superior or even gifted in other directions—for, as we know, genius is often bound up with pathological phenomena—we must deal quite differently. In such a case we might very well recommend a mixed mode of life, in which the one-sided gift is placed with proper precautions, but yet consistently, in the service of some ideal and thus further developed, while on the other hand a more or less intense training in bodily exercises, technical dexterities, mountain-climbing, cycling, agri-

culture, or the like, is prescribed by way of "medicine."

It was formerly a general rule to treat nervous troubles with rest and narcotics. The latter, as we have seen, are to be condemned. The rest, even a long rest in bed combined with overnutrition—the so-called "bed and stuffing cure" (*Bettmastkur*)—can undoubtedly be recommended without qualification in conditions of exhaustion or acute mental disease. But its undue prolongation or its use in the wrong case has the worst effects; which do not need to be gone into again after what has been said already.

General hygiene demands a sound mind in a sound body. But the hygiene of the mind and nervous system demands somewhat more. It often finds our brain confronted with the alternative "culture with deterioration or health without culture"; and in the irrepressible upward striving of superior people towards ideals of knowledge and feeling, the task often falls to it of bringing cultural development and health of brain into harmony. May this little book contribute its part to further the reforms in our mode of life which are so necessary to this end!

APPENDIX

REQUIREMENTS FOR PUBLIC OR SOCIAL NERVE HYGIENE

IN this little book, intended principally for the laity, there can be no question of making definite proposals for the building of lunatic asylums, nerve sanatoriums, and the like. Only a few general requirements whose fulfilment seems to me very desirable can be stated here as briefly as possible:

1. The extension of the fundamental principles of the country training-homes to all schools.

2. For the suitable and appropriate care of habitual criminals, vagrants, incurable alcoholics, etc., and to make them permanently uninjurious, special agricultural establishments with workshops and compulsory work should be established. These should consist of different pavilions for the various different purposes and should be placed under the direction of an alienist and under legal supervision. From these institutions alcohol and all narcotics should be banished.[1] Institutions of this sort for the permanent care of individuals of diminished responsibility who

[1] See Forel: *La question des asiles pour alcoolisés incurables, VII Congrès international contre l'abus des boissons alcooliques*, 1899, tome II, page 92, Paris, 5 Rue de Latran; also *Revue médicale de la Suisse romande*, août 1899, Genève, Georg; and Forel et Mahaim: *Crimes et anomalies mentales constitutionelles*, Genève, Kündig, 1902.

are at the same time very injurious or dangerous to the community should be provided for by law.

3. The alcoholising and degeneration of society caused by our drinking customs should be combated by a progressive promotion of total abstinence. Experience has shown that the most effective measure is local option, by which an electoral majority of the adult men and women of a community has the right to prohibit the sale of alcoholic beverages within its boundaries. Further, the forbidding of the sale of spirituous liquors on Sundays and holidays and late in the evening, and the restriction of the number of saloons. Moreover anti-alcoholic instruction should be introduced in all the schools, temperance restaurants should be established as generally as possible, alcoholic drinks as a means of enjoyment should be removed from all State and municipal buildings, and temperance societies should be energetically supported in their work and development.

In the same way and with the same energy the introduction of other narcotics, which are injurious to individuals and society at large, must be combated so far as they are used merely as means of enjoyment, especially opium, morphia, Indian hemp, ether, and cocaine. We should also combat the tobacco habit, although tobacco is relatively harmless as compared with these other poisons.

4. Nerve sanatoriums are to be reformed by the introduction of occupations for which the patients are systematically trained as a therapeutic measure, and

by the removal of alcoholic drinks. The same should be done with lunatic asylums so far as it has not been done already.

5. Moreover, separate employment colonies should be established in the country for people with nervous troubles.

6. A much more thorough study of the question of human reproduction is to be striven for, in connection with a rational neo-Malthusianism, directed, not to the rooting out but to the improvement of the race.

7. The reform of the dwellings, food, and unhealthy modes of life of a depraved proletariat belongs to general hygiene and needs only to be mentioned here.

Those who are interested in the last questions (in 7) are referred to the other volumes of the *Bibliothek der Gesundheitspflege*,[1] in which they are popularly treated from a scientific standpoint.

[1] Published by Ernst Heinrich Moritz in Stuttgart.



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